The Chemical Age

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The Factories Bill

THE annual dinner of the British Chemical Plant Manufacturers' Association is probably unique among similar gatherings of learned, technical or trade societies. It is the custom at this function for the usual after-dinner speeches proposing toasts to be replaced by an address upon a subject of general importance to the manufacturers of chemicals and plant, followed by an open discussion. This year, the Chief Inspector of Factories, Mr. D. R. Wilson, discussed the Factories Bill now before Parliament. Mr. Wilson made it plain that the present Bill was brought forward solely to make the standard of safety that is already common practice in good firms, obligatory upon all. He pointed out that over a long period, not one single accident in chemical works had occurred from failure of plant, but all were due to failure of operation—which frequently means that the human element was at fault. During a life-time of work a man spends perhaps 50 years of 300 days in the factory. One minute's temporary forgetfulness or lack of foresight (to say nothing of lack of knowledge) may cause his own death or disablement and may involve others in a similar fate. The percentage of working time that this represents is 0.000014—about 1 part in 7,200,000!—a very high standard of efficiency to expect of the human brain. It is small wonder that industrialists and the Home Office generally are recognising that every possible precaution must be taken to render plant and machinery foolproof.

There is only one completely new departure in this Bill that affects plant manufacturers, and that is that the responsibility for safety fittings to a machine which was formerly laid upon the factory owner are now to be shared by the plant maker. The maker will henceforth, if the Bill passes into law, be under penalty to provide proper safety devices. Some important points in connection with this question were raised during the discussion, and these must clearly be brought under examination in the committee stage on the Bill. First, for how long does the maker's liability last? If a machine is supplied with proper safety devices, how does the maker's liability stand if the appliances wear out, or fall off, or are detached by the user? Must every machine maker keep a staff of inspectors to examine every machine he has supplied periodically? We can well imagine instances in which the user might not allow the maker's inspector to enter his works. Mr. Wilson asked that manufacturers should keep in touch with users and should examine the plant they have supplied from time to time. It was replied that frequently this was done, but we seem to remember earlier discussions by members of the Manufacturers' Association in which the plant makers complained that all too frequently they were unable to learn the subsequent history of plant they had supplied to chemical manufacturers. If the onus of seeing that a machine is safe is to be placed upon the machine maker, it should be possible for him to get a certificate from an official inspector when the machine is delivered, or ready for delivery, which should clear him of all responsibility except possibly that due to obvious mechanical failure within a limited period.

What of machines supplied from abroad? The Bill places the British maker under a statutory obligation, but anyone who desires to do so may import an improperly guarded machine. The difference in price between a guarded and a dangerous machine may be 10 or even 20 per cent.; and not all buyers will know that they will have to foot this bill in addition to the quoted price, should they buy from abroad. Certain British interests object to an insistence that machines from abroad should conform with British safety standards on the ground that it delays delivery and it is much better for the safeguards to be added in this country. The argument seems very thin. Few machines that are sufficiently specialised to gain an import duties licence will be built by mass production methods, and there should be no difficulty in fixing additional parts in the foreign works. If it costs more to do so, so much the better for British makers. Perhaps a compromise might be adopted in which the first machine or consignment could be allowed to come in unguarded, and, when the inspector had examined the machine and had given his recommendations, future deliveries must conform with the law.

These new regulations will help the sound, reputable firms in their competition against unscrupulous competitors. When a specification is not drawn up by a technical department, the unscrupulous can find means of offering an inferior article, one of the most obvious of which is to omit essential guards and safety devices. The " smart " buyer accepts the lowest price. Either he must then fit the safeguards in his own works, or his fellow-employees must be subjected to risk.

Mr. Wilson remarked that members of the Association probably had no conception of how many callous employers there were in industry generally up and down the country. All this will now be stopped. The one thing that is necessary is that when the Bill comes into law its provisions should be applied universally, without respect of persons, equally to the little man in the sweated shop and to the great industrial combine. No doubt it may press hardly upon some little men, and time must be allowed for them to bring their plant up to the standard.

Notes and Comments

The Chemist as Citizen

THERE was a time not long ago when the chemist was expected to make his science his all-absorbing interest. As a student he was urged to concentrate on chemistry to the exclusion of everything else, and in his professional life he found the isolated atmosphere of the laboratory inevitably cutting him off from outside interests. Happily there is now a growing recognition of the need for a broader outlook, and the chemist is being plainly told that he must be something more than a good chemist. He must be a good "mixer" with men of other professions and must take an active interest in the world of affairs generally. It is true, as Dr. R. H. Pickard told the Institute of Chemistry in his presidential address, that such pursuits entail sacrifice of time and money, but for a professional man looking for success in life the sacrifice becomes a sound investment. Great concerns are seeking men with the broader outlook, and are prepared to reward them on a higher scale. There is not yet a sufficient supply to meet demands of that kind easily. It is for that reason that Dr. Pickard urges the younger men who hope to secure the higher positions to cultivate and encourage a sturdy individualism; not the individualism of the hermit, but that of the man of marked character who can stand up for himself without being obnoxious about it and is, above all, devoted to good service. Recent publications have shown that the Institute as a whole is encouraging its members to give more thought to matters outside the immediate scope of their profession.

Progress of Electrodeposition

GREAT BRITAIN has been well to the fore in the development of electrodeposition work, both on the research side and in industrial progress, and it was therefore appropriate that the first International Electrodeposition Conference should have been held in London and sponsored by the Electrodepositors' Technical Society. Formed only twelve years ago, the Society has attained a membership of 400, and may well be proud of the success of its efforts last week which brought together representatives of all the principal countries which have helped forward the development of the subject. The Society has been associated from its inception with the Faraday Society and has acted as the national technical body for the dissemination of scientific knowledge on all matters relating to electrodeposition. The Society thus includes within its purview electrochemistry and electrometallurgy, with special reference to electroplating, electrotyping, the preparation, colouring and polishing of metals and the corrosion and protection of metals by electrodeposition and other coating processes. Electrodeposition has made remarkable progress in the past ten to fifteen years. A greater degree of development has probably occurred over that short period than throughout the whole of the previous history of electrodeposition. Much of this progress is due to intensive research work carried out by independent workers, chiefly in universities and technical colleges, by firms interested in the industry and by Government research establishments, of which perhaps the most important is the research department at Woolwich Arsenal.

Choice of Factory Sites

FACTORS which enter into the selection of chemical works sites are discussed elsewhere in this issue. There is no dearth of sites; the problem is to find the right one for the particular purpose in view. Welwyn Garden City, Hull, the North-East Coast, South Wales, Birmingham, industrial Scotland, all offer their own particular contributions to the solution of the problem, and scores of other places which have enterprising development departments could doubtless find equally good reasons for going there. At Welwyn—a remarkable example of modern town planning, 21 miles north of London, with excellent transport facilities and local public services—there are ready-built factories constructed on standard lines awaiting occupation, and fully serviced factory sites, ranging from half an acre to 25 acres in extent. Hull, already one of the great chemical industry centres of England, has an almost unlimited number of sites with exceptional coastal and other facilities. In both cases the development department is ready and willing to co-operate in solving such problems as those suggested by our special contributor. We mention Welwyn Garden City and Hull particularly because they are the only towns that have brought their claims directly to the notice of the chemical industry.

Aid for the Special Areas

THE Special Areas are again being discussed in Parliament, following the issue of a White Paper on the Government's latest proposals. The policy of encouraging industry to establish factories in the areas is strengthened by the provision of further financial facilities. The special commissioners are now authorised to let factories to prospective tenants, and to contribute for periods of five years not only towards income tax and rates, but also towards the rent payable in respect of new undertakings. Thus the policy of helping normal business enterprises "operating for profit," frequently urged by THE CHEMICAL AGE, has at last been adopted. The commissioners' activities will no longer be confined to relief schemes and public works, but will assist industry to establish itself in the areas on a self-supporting basis. Official efforts cannot solve the problem without the wholehearted co-operation of private enterprise. An encouraging feature is the success already attained by a number of pioneer concerns in Durham, South Wales, and elsewhere, without any aid whatever from official sources. If these firms can succeed on commercial lines many more industrialists could succeed with the aids now offered by the Government.

How to Treat Them

GOVERNMENT officials have multiplied on every side and one wonders how one should treat them. There was once a gardener who was troubled with dandelions on his lawn. The more remedies he tried the more the dandelions grew. In despair he wrote to a Government Department about them and received the reply "You must learn to love them." That seems to be the only way to treat Government officials.—Dr. E. F. Armstrong, at the British Chemical Plant Manufacturers' Association dinner.

Plant Makers and the New Factories Bill

Chief Inspector on the Guarding of Machinery

MR. D. R. WILSON, chief inspector of factories, was the principal guest at the annual dinner of the British Chemical Plant Manufacturers' Association at Jules Hotel, London, on March 4, and spoke on the new Factories Bill now before Parliament in its relation to chemical plant manufacture. Mr. J. H. G Monypenny, chairman of the Association, presided, and amongst those present were Dr. William Cullen (president of the Institution of Chemical Engineers), Mr. E. Wallace (chairman of the Association of British Chemical Manufacturers), Mr. L. W. Meekins (United States Commercial Attache), Mr. G. S. Whitham (director of industrial planning, War Office), Brigadier J. C. G. Hunter (director of progress, War Office), Colonel A. W. Garrett (deputy chief inspector of factories), Dr. A. J. V. Underwood and Mr. M. B. Donald (joint hon. secretaries of the Institution of Chemical Engineers), Mr. H. J. Hutchinson and Mr. T. Catling (Import Duties Advisory Committee), Dr. E. F. Armstrong, Mr. E. A. Alliott, Mr. S. Robson, Mr. G. N. Hodson, Mr. C. P. Merriam, Mr. I. E. Weber, Mr. H. V. Potter, Mr J. Arthur Reavell, and Mr. K. Fraser.

Re-Armament and Normal Work

The CHAIRMAN, in welcoming the guests, referred particularly to the presence of Mr. Whitham and Brigadier Hunter, representing two important new departments at the War Office, and expressed the hope that the armaments committee would endeavour to adjust its demands so far as possible not to interfere more than necessary with general commercial work, and that at the end of its programme it would avoid creating a slump such as that experienced round about 1922.

Mr. WILSON said it was important that the Factories Bill should be considered by such an organisation as the British Chemical Plant Manufacturers' Association before it became law. The eagle eye of Mr. Davidson Pratt, their secretary, had discovered some points which he had discussed with the Department, and which he thought could be satisfactorily adjusted. The Bill was a formidable document of 152 clauses. The safety provisions were not likely to affect the manufacturers of plant very much, except in one respect. The clauses in that part of the Bill were of three kinds. In the first place they dealt with safety precautions already in force, which were amplified and made more detailed. There was a clause dealing with hoists and lifts which were already required to be securely fenced in certain premises; in the new Bill they were dealt with in much greater detail. The second class of clause dealt with requirements already in force in certain industries by means of regulations, particularly the Chemical Works Regulations, which would now be made more general and become applicable to all industries.

There was a clause dealing with the safeguarding of vessels containing dangerous liquids which had for many years been in operation in the chemical industry, and which it was felt should be applied to any industry as a reasonable and proper safeguard. Cranes had already been subject to certain requirements in docks and harbours, and he saw no reason why those regulations should not apply to industry generally.

A New Departure

So far as chemical works and the makers of chemical plant were concerned he did not think the Bill would have very much effect, with one exception—a new departure. There was one clause in the Bill which dealt with the responsibilities not of the users of a machine, but of the makers. Up to now the whole of the old Factories Acts had placed the entire responsibility on the occupier of the factory, the man who actually used the machine, and to a very small extent, if at all, had the maker been brought within the purview of the law. Following the recommendations of a committee which had sat for many years it was now proposed to include a clause making it a requirement that any new machine should conform to certain specified conditions. Those conditions were elementary and the idea was to help the buyer of the machine by having it properly guarded before he took it on to his premises.

There was a clause making it an offence for a person who sold a machine to a buyer in this country which did not comply with those provisions. How far that would affect the members of that Association he did not know at present. The clause was framed in perfectly simple language, and only dealt with rudimentary precautions, but power was given to the Secretary of State to extend the scope of the clause so as to embody in it other points which were not at present mentioned in the clause itself.

Real Object of the Bill

The whole object of the Bill was to bring up present standards not so much to the best existing practice, but rather to good existing practice, and that was the proper way to develop industrial legislation. He knew from his experience that there were a great many people in the service of employers of whom it could be said that while they were not callous, the last thing of which they thought was the welfare of their employees, and he was glad to think that the Bill had been strengthened, not at the expense of people like those whom he was addressing, but at the expense of people who would not bring their factory conditions up to a proper standard without being compelled to do so.

He had obtained a return relating to accidents upon plants of the type for which chemical plant manufacturers were responsible, and he was happy to say that he could not trace one accident that had occurred through failure of the plant itself. There had been several others, some of them very serious, but they were not due to failure of the plant, but to failure of the operation of the plant, and therefore matters for which they were not directly responsible. "You supply fine plant with a large margin of safety," continued Mr. Wilson, "but what happens to it afterwards? It is in the hands of people, probably some good, some bad, some careless, some indifferent. Are there any means of keeping in touch with the buyers of that plant? Is there anything like the service department of a motor car company? Have you any means of satisfying yourself that the plant is kept in good condition? I wonder if anything of that kind could be done. Perhaps it is done. I do not know, but it seems to me that to make a good plant and then to send it out to be used without any further supervision is in a sense asking eventually for trouble, in some quarters at any rate.

Making Plant Foolproof

"A second point I would like to ask you to consider concerns the operational side. One of the most distressing accidents that came to my knowledge—and it is still a nightmare to me—was a case of four boys inside a kier used for bleaching purposes. Unfortunately a fellow operative turned on the hot liquor when they were inside, and they were scalded to death. That was due to momentary forgetfulness on the part of the operative. The lesson to be learnt from that accident is that plant should be made as foolproof as possible, and that any disaster of that kind should be made impossible. How far that side of your work has been developed I do not know, but I venture to suggest that it is one of the matters that might be considered. Every ingenuity is expended on the constructional side of the plant; is there not room for the same amount of ingenuity on the operational side? Through an association of this kind means and ways can be developed to protect the operatives against themselves, especially in plants such as you make, in which mishaps, if they do occur, may have disastrous results."

Dr. E. F. ARMSTRONG said so long as the new Act—when it

became an Act—was administered by the Home Office in the same spirit as previous Acts had been administered they would be in safe hands. Everyone present represented the broad-minded type of employer who was anxious to avoid accidents, and to do everything in his power to prevent them. He hoped the Department would be equally assiduous in applying the Bill to the type of employer, not represented in that gathering, who did not observe such Acts as he should, and in that respect gained a great advantage over those who did.

The Cost of Safety Measures

Mr. J. ARTHUR REAVELL said an important question was the protection of moving parts in chemical plant. Manufacturing firms who were conscientious in putting forward protective propositions which demanded great care very often lost contracts because they found themselves up against buyers who did not appreciate the importance of those protective measures. On some installations as much as 10 or 15 per cent. or even more of the cost had to be expended in taking care of the protection of moving parts. Big firms had their specifications properly drawn up by their technical departments, but when the plant manufacturer came up against the buyer who was more or less left to himself, a contract was often lost simply because of the extra cost of the necessary protection. It was of enormous importance to those who were supplying plant on a large scale that that point was dealt with in the new Bill, and that the manufacturer of plant and machinery was to be held responsible. To a certain extent it would prevent the uninitiated from buying plant without protection; from getting something cheap at the expense of risk to the operator.

Referring to Mr. Wilson's remark about service, Mr. Reavell said reputable firms of plant manufacturerers did give service. Their inspectors or engineers from time to time went to look at the plant they had supplied. He welcomed the Bill as a means for compelling those plant users who were careless about such matters to buy their plant from reputable firms who insisted upon proper protection.

What About the Foreign Maker ?

Mr. W. J. HOOTON said plant manufacturers desired to turn out machines that were right. They welcomed the Bill and would do their utmost to carry it out, but it must be realised that there were points in the Bill that were open to improvement. He wished to point out that while the British manufacturer did not wish to supply machinery that would kill men he did not want foreign machinery to come in without the same precautions, and he urged that the Bill should be extended to cover that point.

Mr. E. A. ALLIOTT said it was important that everybody supplying plant and everybody installing plant should know exactly where they were, and they could congratulate themselves upon the very great amount of common sense shown by the higher officials at the Home Office in dealing with this subject. The only trouble one had in supplying guards to any machine was the case of the new inspector, not used to his job, who wished to impose some totally absurd conditions. Fortunately owing to the common sense of the higher officials it had generally been possible to get over such incidents without much trouble. He cordially agreed with Mr. Hooton that people sending machinery into this country from abroad should be made equally liable.

Mr. J. DAVIDSON PRATT, secretary of the Association, said if they took the trouble to read the Bill they would be surprised at the modest requirements it imposed. All that it asked was what the best employers in the country had been doing for years in the interests of their employees. One might ask why it was necessary to insert them in the Bill. It was because there were a number of employers who would never think of their employees and who would not take these common sense precautions until they were compelled to do so. Safety and welfare of employees should be dear to everyone of them. After all they might be employees themselves some day and they did not want to be subjected to unnecessary hazards. If they wanted to prevent some more strenuous legislation it was up to them to adopt real safeguards for their employees and to persuade every member of their industry to do the same.

The Bill was directed at the less progressive members of the industry. Take the simple case of solvents. There were many solvents in use to-day, some very toxic and others not very toxic. The people who made them knew about their toxicity, but many of the users took no common sense precautions at all. We were intended by nature to take certain things into our systems. Anything else taken into the system was bound to be deleterious in the long run, and if we looked upon all precautions in that way we should have taken a great step forward.

Mr. L. W. MEEKINS, United States Commercial Attache, referring to the point raised by Mr. Hooton regarding imported machinery, said that so far as the United States was concerned he could see no objection to the clause being made to apply to such machinery. "We certainly do not want to sell any machinery in this country which is dangerous to us," he added.

Mr. W. J. HOOTON, referring to the liability placed upon plant manufacturers for the safeguarding of machinery, asked if any information could be given as the limit of time during which such liability existed. For how long a period was the manufacturer to be liable to be summoned in respect of accidents ?

Colonel A. W. GARRETT, replying on behalf of Mr. Wilson, said, in the language of the House of Commons, " We must have notice of that question."

Air Raid Precautions

£4,000,000 for Manufacture of Gas Masks

THE gradual development of the Air Raid Precautions Department at the Home Office is reflected in the figures announced in the Civil Votes for the Home Department, Law and Justice. Out of a total of £5,776,259 for the Home Office, £4,617,500 is allocated to air raid precautionary services, compared with £1,358,250 in 1936, or an increase of £3,259,250.

There is a further £598,000, a new item, for fire brigade services. Of this £500,000 is for the accumulation of emergency fire-fighting appliances and equipment; £10,000 for research and experiments; and £88,000 for grants to local authorities towards the initial cost of training emergency personnel and of other local emergency fire brigade services. Respirators and similar devices are estimated to cost £3,530,000, and other equipment and material £446,000, a total of £3,996,000, compared with £1,240,000 a year ago.

A total of £343,000 (against £87,500) is included for special services, which cover training, research and experiments. The Chemical Research Department and Research Department, Woolwich, will receive £60,000 of this through the War Office. A similar sum will go in research and expenses; £23,000 is provided for training expenses; and £200,000 for special services. The staff at the Civilian Anti-Gas School has been increased from thirty to fifty-six. In a total of £22,500 is included £6,500 to provide the staff of an additional school.

Estimated cost of respirator factories is £61,000; the inspection and examination of respirators and other equipment and material will involve an estimated expenditure of £25,500; while storage and distribution of respirators and other equipment and material are expected to absorb £104,500.

THE South African Railway Administration has undertaken a series of experiments with " dry ice " as a refrigerant. It is hoped to obtain data which will assist in determining whether it may be possible to use " dry ice " made in South Africa as an economic and efficient substitute for ordinary ice in railway refrigerated space.

Casein in the Manufacture of Plastics

The Formaldehyde-Casein Reaction

CASEIN materials as applied to plastics were the subject of a paper which Mr. Robert Dodd read before the Plastics Group of the Society of Chemical Industry in London, on February 16.

The casein molecule, said Dr. Dodd, can be considered as a complex system of conjugated amino acids. These amino acids are themselves relatively simple substances and the structure of most of them is known. Two or more of them can unite to form larger aggregates which can in turn unite to form still larger ones. This building up continues until the casein molecule is formed. The amino acids $NH_2.R.COOH$, where R is the hydrocarbon residue, are characterised by their amphoteric properties: they can act as a base by virtue of their amino group, and as an acid by virtue of the carboxyl group. The amino group of one acid can unite with the carboxyl group of another acid with the elimination of a molecule of water to form a larger complex,

Left.—Formaldehyde tanks for handling the casein at the works of Erinoid, Ltd.

Below.—Press shop in which the dough is pressed into sheets by multiple hydraulic presses.

Photos: Industrial Chemist.

$$NH_2R.COOH + NH_2R.COOH = NH_2R.CO.NHR.COOH + H_2O.$$

The resulting substance can then enter into combination with another amino acid or with a larger complex and thus it will be seen that these amino acids are building stones on which the casein molecule is built up.

Rennet Casein

In the manufacture of rennet casein the clean neutral separated milk is treated with rennet at a temperature ranging from 37° to 41° C. As soon as the milk is set to the gel condition an agitator is started and the temperature is raised to 65° C. The proteid is thus thrown out in fine particles and then allowed to settle to the bottom of the vat. The condition of the curd is important and is controlled to some extent by the speed of the agitator. It is important because of the washing which takes place to remove the whey. Too slow agitation produces large clots in which the whey gets locked up, while fast agitation causes too fine a curd to be precipitated, thus resulting in loss through difficulty in separation after each washing. The washing should be as thorough as possible, to remove the whey, otherwise, on drying the curd, discoloration takes place due to the presence of lactalbumen. The separated curd, pressed, washed, and free from whey, is dried by passing through a rotary drier. The curd slides down a special chute and hot air runs counter to the flow of the casein

History of Casein Plastics

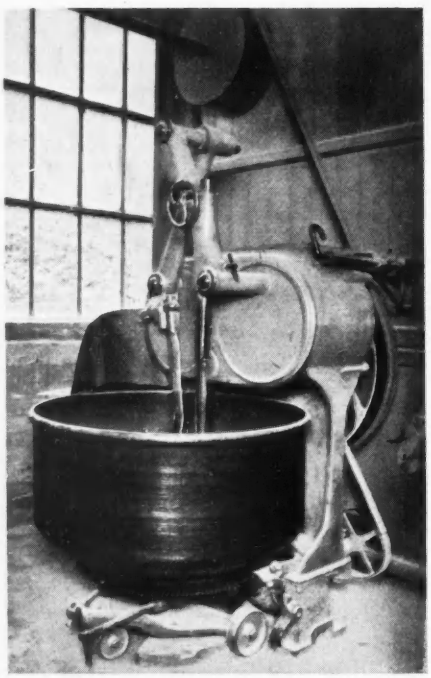
About the year 1897, W. Krische, a printer in Hanover, evolved the idea of coating white cardboard with a solution of casein, thus producing a film which he intended to harden, and to render waterproof by subsequent chemical treatment. At the same time Adolph Spitteler, of Prien, in Bavaria, was working upon the problem of waterproofing casein. As the result of collaboration these two workers discovered the formaldehyde-casein reaction on which the whole industry is based. An English patent was taken out in October, 1897, and they then devoted their energies to the exploitation of this discovery. They worked more on the idea of producing plastic materials in the form of masses, rather than as protective coatings. The process was finally taken up by the Galalith Co., of Harburg, and developed as a commercial proposition.

The history of the development of the industry in England is also interesting. In 1909 a Russian student, Victor Schutze,

of Riga, patented a process for the manufacture of solid plastic material from milk curds. This process was bought by an English company and a plant was erected to work it. The process as patented by Schutze was found to be impracticable, being based on what is known as the "wet process." The English company had therefore to work out quite independently a modification of this process. This was done successfully, and the process so worked out is now known as the "dry process" and is universally adopted as the standard method.

Manufacture by the Dry Process

The casein is treated by means of heat and pressure with the minimum quantity of water to effect its flow during the process of manufacture. Rennet casein is used exclusively in the production of casein plastics, and the dry rennet casein is ground to pass 40 mesh per inch. It is important to note that the temperature of the casein is kept as low as possible during the process of grinding, otherwise discoloration of the casein will result. The type of mill used for this grinding is the flour mill type, in which the material passes between finely corrugated steel rollers. The standard charge for an operation is 60 kg. of ground casein. The charge is placed in a suitable mixer, and any dry pigments which have to be added are mixed in at this stage. The colours are produced mostly by the addition of acid dyestuffs. The dye is dissolved in a definite proportion of water and sprayed on to the mixing; the mixing is then further continued until a uniform distribution of the dye solution takes place through the mass. The mixing machines which are used for this purpose are of the dough-mixing type.



Mixer for mixing the dyes and pigments with the casein.

The dyed powder is now fed to extruding machines. These machines are of the same type as are used in the rubber industry. They are modified in various ways to meet particular requirements, and consist of a jacketed worm, arranged so that complete temperature control can be obtained either by steam or water circulation. The machines are fitted at one end with a nozzle which has various screens inserted to control the flow of the material as it passes through the machine. The screw plasticises the dyed powder as it comes forward to the nozzle; the screens put up a resistance, and assist in the production of a thoroughly homogeneous product. The material as it now leaves the nozzle of the machine is in a soft and rubbery condition.

Mottled colours are produced by mixing the feed powder with so-called "nibs" of the complementary colour or colours required. These nibs are made by extruding rods of about 4 mm. diameter, these thin rods being cut up by chopping machines into 4 mm. lengths. The fact that these nibs have passed through the machine ensures a preliminary plasticising caused by the action of the screw. When they are now mixed with the base powder and again fed in the mixture to the machine, they are obviously harder and tougher than the base powder and thus stand out in relief to form the required pattern and colour.

The plastic material extruded by the machine is made in the form of rods, ribbons or tubes, as may be required. If sheets are being manufactured, the ribbons or rods are cut to a definite length, weighed off according to the thickness of the sheet required, and placed in a steel mould. The moulds are then placed in a hydraulic press and the material is subjected to heat and pressure. The final pressure may range from 150 to 200 tons on the platen.

The material is cooled before removing from the mould. At this stage it will be found to be still in a soft and somewhat rubbery condition, but it is sufficiently rigid to stand upright in racks. These racks containing the casein sheets then pass into formaldehyde tanks, where a prolonged treatment in a 4 to 5 per cent. solution of formaldehyde is given. The thickness of the material determines the length of time that the sheets have to be immersed, and this treatment may vary from 10 days to 10 weeks. The sheets pass from the tanks to the drying room and are dried out in a plentiful supply of air, the temperature being kept round about 27° to 32° C. During this drying the sheets may warp considerably, and they have to be finally straightened. This is done in hydraulic presses. They are softened by dry heat first of all, and then pressed out. After this final straightening, they remain rigid and are ready for the market. The size of the sheet manufactured is usually 20 in. by 16 in.

Manufacture of Tubes

In the extruding machine, the material which has to be made into rods is cut off in 30- or 40-inch lengths, and is cooled and placed in trays. If tubes are required, the nozzle of the extruding machine is fitted with a screen which carries a central pin. This pin passes through the nozzle and may project slightly at the mouth of the nozzle. The material flows round the pin and so forms the required tube. The tubes and rods are placed in trays and then pass into the formaldehyde tanks where they remain until complete formalising takes place. The circulation of the formaldehyde in the tanks is of the utmost importance, as is also an accurate temperature control. Both these factors have a definite bearing on the length of time required in the formalising process.

When the rods and tubes are completely formalised, they are dried in rotating drums through which hot air is passed. They come out of the drums at the end of the drying process perfectly straight. This finishes the actual manufacturing process; further treatments of the material, such as sanding the sheet to a smooth surface, "trapping" the rods (which is a process of central grinding) to accurate dimensions, and finally polishing, both sheets and rods, are more in the nature of finishing operations than actual manufacture.

The specific gravity of the casein plastic material is 1.33 to 1.34; age and atmospheric conditions may cause a variation of that figure ranging over a half per cent. either way. At 130° C. the material starts to discolour, but this discoloration is very slight and only shows in the more delicate colours. At 160° C. the discoloration shows in all colours, but the material still retains its plastic and cohesive nature. At 200° C., after some minutes disintegration takes place. The material is non-inflammable and will only burn on being held in a flame. It is somewhat hygroscopic and can be softened in hot water, moulded and pressure polished. It is an excellent insulator and can be used for all low tension work, but on account of its hygroscopic properties it is not suitable for high tension or outdoor work of any description.

Selecting the Site for a Factory

By J. H. WEST, M.I.Chem.E.

THERE may be some controlling consideration which fixes the locality of a new chemical factory without further argument. Proximity to another factory producing an intermediate product which is to serve as raw material for the new factory, or proximity to an existing factory in order to centralise and facilitate the higher management of both, are instances.

There may again be some technical requirement which limits the choice of district, but, apart from limitations of these and similar kinds, the problem really boils down to the economics of transportation for raw materials and finished products, and these must be worked out for each individual case.

Raw materials may be all or mainly imported products, in which case the factory will probably have to be put near a seaport or a river navigable by barges. Or perhaps some material such as coke or limestone is needed in large quantities; then obviously a district must be selected where supplies will be available close at hand.

Nearness to Markets

Nearness to markets for finished products is a very important matter, even more so than nearness to supplies of raw materials if the weights are about equal or greater in the case of finished products. This is because the rates per ton-mile for the latter will almost certainly be higher, and may be several times as high if the goods are sent out in small packages. Cost must be considered, not merely distance, and in order to arrive at a position for the factory which will entail minimum cost of transport the total annual tonnage of raw materials and that of finished products should be worked out, and the rates per ton respectively ascertained, so that by multiplying these figures by the distances between the place or places of supply of materials and destination, or average of various destinations of products, and any spot on the map the total cost of transport can be closely estimated for that position of the factory.

Cost of transport is, of course, not the only question to be considered. If large tonnages of cheap materials are to be dealt with it will undoubtedly be very important, but where, on the other hand, comparatively small quantities of valuable materials are being handled the cost of transport may be only a negligible fraction of the total cost of manufacture, and other considerations become the controlling factors.

Skilled labour of a particular type may be needed which is more easily obtainable in one district than another, or a plentiful supply of unskilled labour at low rates or of female labour may be essential, and for this reason certain districts may have to be ruled out. Then again certain technical questions, such as the need for a supply of power gas or cheap electric power, may be the deciding factors. This applies mainly to the smaller factories where it would not pay to put in a gas generating or power generating plant.

Other service items, such as a supply of hard water in the case of breweries, and soft water in certain other industries, or in some cases a very abundant supply of cheap cooling water, may have to be taken into consideration. The cost of land varies very greatly between different districts, as do the local rates, and these factors should not be forgotten in coming to a decision.

Choice of the Actual Site

Having weighed up all the advantages and disadvantages of various parts of the country, districts, cities and towns, and decided the best whereabouts for the factory, the next thing is to go and look at the available sites and choose the most suitable one.

If the factory is to be in or near a city or big town it must first be decided whether to look for a site within or just outside the city or urban boundary. A good deal may depend on this, particularly as regards the local rates and local regulations.

Take the case of London for example. Many people prefer to keep outside the London County Council boundary so as not to be subject to the very stringent building regulations in force within it, and the new and vexatious regulations of the Metropolitan Water Board are tending to keep factories outside the boundary of that authority. It need hardly be pointed out that the regulations and charges of *all* the local authorities with whom the factory is likely to have any contact, not forgetting the conservancy or drainage board if there will be any factory effluent, should be ascertained and carefully studied before any site is decided upon. This applies also to the local gas and electricity companies, and it is a good thing, before a final decision is made, to see the senior officials of these boards and authorities and explain the nature, scope, and requirements of the new factory so as to get their help and co-operation from the start. If this is done, and the correct procedure to be followed in making application for services and permission to discharge effluent and so on is ascertained and followed, it will be found that the inevitable red tape unwinds more easily and some concessions from the strict rigour of the regulations can sometimes be obtained.

Leave Room for Extensions

Finally we have to weigh up the comparative merits of the various plots of land which are available in the locality decided upon. First, as to size; above all do not cramp the site, leave plenty of room for extensions, and remember that a few patches of waste land round a factory are needed for dumps of scrap material and rubbish and similar purposes. In a good industrial district the purchase of land suitable for factories is generally a good investment, and if the extra land is not needed it can be let or later on sold at a profit.

Ease of communications, whether by road, rail, or water, is of great importance, and, apart from the question whether the latter two facilities can be made available at a given site, the cost of making the necessary connections must be considered. Will a jetty or canal wharf have to be built, for instance, or will the connection to the main line railway be a big and expensive job? The same sort of questions must be asked about town water, gas, and electric supplies, and while we are thinking of service supplies, connection to the sewer system will have to be made, and possibly a special outfall for trade effluent if the factory is near the sea or an estuary.

Conditions of the Site

Next come two questions which are related; the levelness or otherwise of the site and the nature of the subsoil and underlying strata. If the site is reasonably level little or no expense will be incurred for excavation, apart from foundations, or filling. If levelling operations have to be undertaken their cost will depend on the nature of the subsoil to some extent. If this is rocky or hard gravel it will cost more. The cost of foundations will depend very greatly on the nature of the subsoil. Heavy clay or compact gravel can be loaded to three or four tons per square foot, whereas the soft clay found near river estuaries may only bear a quarter or less of this loading.

If the subsoil is soft it is important to know how far down one must go to find a solid bottom. In bad cases piling will have to be resorted to, and the expense of this is very serious. From a geological map of the district and by inquiry from others, especially well-sinkers, in the neighbourhood one can find out pretty well what lies below, and at the same time get an idea as to whether it is worth while putting down a trial bore in the hopes of getting an independent water supply.

The Second World Petroleum Congress

Problems for Paris Meeting

THE second World Petroleum Congress, organised by the Association Française des Techniciens du Pétrole, will be held at Paris from June 14 to 19.

The work of the congress will be divided over five sections: (1) Geology and drilling, (2) physico-chemistry and refining, (3) material and construction (4) technique of the uses of petroleum products, and (5) economic and statistical. The economic section proposes to study the question of petroleum in the past and present, and to put forward conclusions on the part which these congresses play, which would be notable to ensure international relations from the point of view of a common policy, to make instruction uniform and to standardise the methods and nomenclatures used in the petroleum industry; technical and commercial standardisation which, from the economic point of view offers very great interest.

Standardisation Centres

There are various technical standardisation centres: Professional (refineries), corporative (syndicates), national and international. In each of these, different problems present themselves. Several international organisations have already made attempts at petroleum standardisation, and it is first of all necessary that these should be realised for the national plan. In France this task has been undertaken by the Association Française de Normalisation. The co-ordination of national works, decided in 1933 by the World Oil Congress in London, and placed under the ægis of a special committee, will benefit by exchanges of views likely to result in general agreements.

Units of measurement, densities and tonnages, vary with the countries. In the United States, the unit of measurement most used is the barrel, with a capacity of 159.19 litres, containing 42 American gallons, of a capacity of 3.785 litres each. In England, the capacity of the imperial barrel is the same as that of the American barrel, but the capacity of the imperial gallon being 4.546 litres, the imperial barrel contains 35 imperial gallons, or English gallons. In France, the metric system is in force, but the Customs base their measure by volume and by weight, quintal and hectolitre. The specific gravity of the products not being indicated, it is not possible to arrive at a common measure which allows of accurate addition. Even if the densities were indicated, it would be difficult to arrive at exact parities, as the methods followed to arrive at these densities are very varied.

Roumania bases her statistics by wagons of 10 tons; Mexico by cubic metres.

In reference to tonnages, the same problems present themselves. Marine transport companies have a tendency to indicate the tonnages without any other details, the term "ton" applying, however, according to the case, to the gross tonnage, to the net tonnage or the actual cargo. The metric ton is 1,000 kilogrammes, and the English ton (long ton), 1,016 kgs. No corresponding universal table so far exists between these various methods of measuring.

Need for a Common Language

A common language would considerably facilitate the work of the suppliers, importers and statisticians who record details. The metric system has been suggested as a possible basis of agreement.

The plan of work of the economic section of the congress presents great variety. The history of petroleum in its early stages, notably, uses in architecture, navigation, war and medicine, is of great interest. The principal efforts of the section will be directed towards practical present-day questions. This section will study the world production of petroleum, which increased from 300 tons in 1859 to more than 207,000,000 tons in 1934. We are far from the eighteen forties, when an American colony, having discovered a source of crude petroleum near Pittsburg, sold it in small bottles under the name of "seneca oil," the admirable healing properties of which were supposed to cure skin troubles, angina, hepatic diseases, stomach trouble, phthisis (consumption), and cholera.

The new methods of treatment in the United States have brought to almost 47 per cent. the benzine extracted from the crude in 19344 against approximately 18 per cent. in 1914. Without the progress of industrial methods, notably cracking, a world production of crude four times higher than the present output would have been necessary in order to arrive at the quantity of benzine required to-day.

Investigations in reference to the legal statutes of petroleum companies, legisation, finance, sundry occurrences, and technical instruction, will complete the cycle of the work of the economic section of the congress. French will be the official language, but communications and reports may also be drawn up in English and in German.

Letter to the Editor

Scientists and Gas-Proof Rooms

SIR,—Professor Bone's letter re gas-proof rooms raises a question of serious importance to householders, particularly those who, having no scientific or technical training to guide them, are helpless against this 20th century development of civilised barbarity, the poison gas bomb: an engine of iniquity capable of working incalculable havoc unless some means can be found to minimise its dire effects. Probably the danger has been considerably exaggerated by alarmist press reports, but as it appears that unless some safeguard can be found and put into operation before the danger materialises there is nothing to hinder any ambitious military power from attempting to terrorise its weaker or less prepared neighbours by such means and doing a vast amount of destruction before its adventurous career can be curbed or brought to an end.

Actually, however, I believe living rooms can be made reasonably safe against gas raids by the simple expedient of closely covering all air inlets such as doors and windows with loosely woven textile fabrics such as blankets or cotton sheeting moistened by a 20 to 25 per cent. solution of equal quantities of carbonate and acetate of soda; this acts as an absorbent of such gases as chlorine, bromine and nitrous oxides, and will doubtless also absorb or neutralise other constituents more or less completely, at least sufficiently to render a living room safe for several hours, if several thicknesses of absorbent material are used as protection.

Doors and windows, if sufficiently screened by this means, need not be closed, but preferably left wide open to allow filtered air to enter and prevent the atmosphere from becoming fouled by the breathing of the inmates. Gas masks can be made of similar material folded into soft pads $\frac{1}{4}$ or $\frac{1}{2}$-in. thick and large enough to cover the face, leaving room for goggles if they are needed. Of course, such masks must be fitted closely enough to ensure that all air inhaled passes through the moistened fabric before entering the lungs. Masks of this sort have been used for years by men employed in chlorine factories and can be worn without serious inconvenience for several hours in an atmosphere strongly impregnated with chlorine or other poisonous gases, such as nitric or nitrous oxides. Any housewife should be able to make one at short notice by folding suitable material, either knitted or woven, and attaching tapes or bandages as required to keep it in position.—Yours faithfully,

J. K. HILL.

13 Copland Place, Ibrox, Glasgow.

The Theory and Practice of Leaching

Tanning Extracts, Beet Sugar and Copper

IN his paper on "Leaching in Theory and Practice," read at the 15th annual corporate meeting of the Institution of Chemical Engineers, in London, on February 26, Mr. M. B. Donald, M.Sc., A.R.C.S., F.S.C., said the term "leaching" should be employed where water is used as a solvent, and extraction for the general case, as this follows most closely the accepted usage. In any text book which refers to leaching, there is to be observed a general confusion of the unit operations of (a) percolation extraction and (b) multi-stage extraction. No information appears to be available to the chemical engineer who wishes to know which of these alternatives it is preferable to employ for a specific case. The difference, however, is quite definite, as will be readily appreciated from a study of the counter-current extraction of solids in a number of stages by means of solutions of increasing concentration. A distinction should here be made between washing and extraction. Sometimes, the object is merely to remove by washing some unwanted soluble constituent, for example, salt from leather, and in this case the quantity of water used is not very important. In other cases, it is necessary to extract a soluble constituent from a raw material to give as concentrated a solution of that constituent as possible, for example, sugar from beet, gold from quartzite, KCl from crude carnallite, etc.

Developments in Past 50 Years

Hides and skins were originally tanned by allowing them to soak in contact with oak bark, and it is only during the last fifty years that tannin extract has become more generally used. The tannins are derivatives either of the *o*-dihydroxy-benzene, catechol, type or of the 1 : 2 : 3-trihydroxybenzene, pyrogallol, type. Oak bark contains both types, which probably accounts for its early popularity since both classes of tannin confer on the leather their own characteristic properties. Unfortunately, oak bark is comparatively poor in tannins (11 per cent. tannins, 11 per cent. non-tannins, 68 per cent. insolubles, 10 per cent. water). In searching for suitable alternatives, the chief factors are the cost per unit of tannin and the purity of the extract.

The factors which require consideration in leaching are (a) size of the material, (b) time and (c) temperature. Just as for beet sugar, it is essential not only to obtain good extraction, but to avoid removing the soluble constituents.

Wood is generally converted into shavings, and the thinner the shavings, the sooner is the tannin extracted, although the cost naturally rises considerably. G. T. Gayley ("J. Amer. Leather Chem. Assn.," 1920, *15*, 344)found that a cube of chestnut wood having an edge of 1 in. gave up only 34 per cent. of the tannin extracted from an equal quantity of sawdust treated for the same period of time. If the area were trebled by splitting the cube in a direction parallel to the grain, the extraction rose to 44 per cent., but only doubling the area by cutting across the grain gave a rise from 34 per cent. to 72 per cent. This would indicate that the tannins diffuse preferentially along the fibres instead of across them and conforms to what would be expected from a consideration of wood structure.

Time of Extraction

The time of extraction decreases as the temperature rises. P. Pawlowitsch ("Die Gerbextrakte," Wien, 1929, p. 150) states that, for pine wood, a battery of six to eight open diffusers at 100° C. required 16 to 24 hours for the same extraction obtained in closed diffusers with calorifiers at 100° to 120° to 120° C. after only 8 hours. The optimum temperature of extraction varies with different materials but is usually about 80° C. Below and above this temperature, the purity coefficient of the extract decreases.

More consideration has been given to the development of leaching in the beet sugar industry than is the case with the smaller industries of tannin, dyewoods, etc. The temperature of leaching has been gradually increased until the optimum temperature is now considered to be 72 to 78° C. Actually, a high temperature helps to coalgulate albuminous material and increase the rate of diffusion, provided that the influence of time and temperature does not result in destruction of the cell walls. On the other hand, low temperatures not only favour bacteria, but also the enzymes diastase (60 to 68° C.), and peptase (38 to 49° C.), which produce glucose and soluble amino-compounds, respectively.

Leaching of Copper Ores

The leaching of copper ores with ammoniacal solutions has been adopted in plants operating in Alaska, Michigan and Northern Rhodesia. The ore of the Kennecott Copper Co., in Alaska, contains 1.46 per cent. copper, of which 1.14 per cent. exists as carbonate in a dolomitic limestone (calcium and magnesium carbonates), so that acid leaching is impossible. The tailings at the Calumet and Hecla Co.'s plant, at Lake Minden, in Michigan, contains 0.64 per cent. of native copper, but no sulphide or oxidised copper minerals. In the more recent plant at Bwana M'Kubwa, in Rhodesia, now closed, the copper occurs as 4 per cent. of malachite ($CuCO_3$, $Cu(OH)_2$), and chrysocolla ($CuSiO_3$, $2H_2O$), in a rock consisting of quartzites and sandstones.

The first large scale development in tank leaching of low grade, 1½ per cent., copper ores was made in Chile when the Chuquicamata plant was started in May, 1915. Although copper exists as sulphides at low depths, at the surface it has generally weathered to other compounds, according to local conditions. The deposit at Chuquicamata contains brochantite ($CuSO_4$, $3Cu(OH^2)$), chalcanthite, ($CuSO_4$, $5H_2O$) and atacamite, ($CuCl_2$ $3Cu(OH)^2$), in an ore-body of soda granite (granodorite).

In 1914, it had also been found by experiments that, at Ajo, Arizona, the low grade ore, which consists of malachite ($CuCO_3$, $Cu(OH_2)$, in an ore-body of monzonite (poorer in silica but richer in sodio-calcic felspar than the Chilean ore-body) could be leached with 5 per cent. sulphuric acid more cheaply than chloridising with subsequent leaching. A test made upon a bed of ¼ in. material up to 15 ft. deep gave an 86 per cent. recovery in 4 days. The large scale plant was started in May, 1917.

The Inspiration Plant

For some time, it was considered that the sulphide ores could not be extracted sufficiently rapidly for tank leaching, but, in October, 1926, the Inspiration Plant was started near Globe and Miami, in Arizona, for ores containing chrysocolla ($CuSiO_2$, $2H^2O$) and chalcociae Cu_2S). The acid leach liquors were purposely maintained with a certain ferric sulphate concentration to ensure sufficiently rapid oxidation of the sulphide. Actually, this process is approaching the heap-leaching process used at Rio Tinto, Spain.

J. D. Sullivan has investigated ("Trans. Amer. Inst. Min. Eng., 1933, *106*, 515) the leaching of copper ores and finds that Cu_2S gives up half of its copper rapidly to solution until it has all changed into CuS (covellite), when the rate of solution is very slow. The most insoluble copper sulphide, chalcopyrite, Cu_2S, gives up half its copper rapidly to solution until it is to some extent independent of particle size, which would indicate that solution takes place along capillaries in the insoluble matrix.

Downward flow, in addition to the advantage of displacing heavier liquors by lighter ones above them, also provides a filtering action. This is due to the fine solids from the previous tank being deposited on the top of the solids in the next tank, to form a type of graded filter bed. The protagonists

of upward flow in leaching claim that, in actual practice, the mixing of the light liquors with the heavier ones above them does not take place to an appreciable extent. They claim that upward leaching tends to float the solid particles, and hence no channelling of liquors takes place such as with downward flow. This latter fact is generally acknowledged, since, in most processes, the tank containing the raw material is filled from the bottom upwards. The floating of the solid particles, however, produces a type of elutriation, and the very finest material is carried over and contaminates, to no small degree in some cases, the strong liquor.

The Wash Water

The amount of wash water receives a great deal of attention, but actually the quantity of water is limited to that taken out in the concentraed liquor and that which goes out in the residue. Using more wash water results in a wetter residue. It would appear that the amount of moisture to be left in the residue should be as small as possible, contingent with easy discharging properties.

With regard to the number of diffusers in a battery, Turkiewicz ("Z. Ver. Deut. Zuckerind.," 1889, *39*, 69, 375) found that, by cutting a battery of twelve beet sugar diffusers in two, he could obtain better results. Some experiments carried out in 1889 gave the following results :—

	Charges per day.	% Sugar in Exhausted Cossettes.
One battery of 12 diffusers	194	0.24
Two batteries of 6 diffusers	238	0.32

This showed that a 22 per cent. greater throughput was obtained at a slight reduction in the efficiency of extraction, by dividing the battery. The same result is found in the nitrate industry :—

	Charges per day.	Leaching Efficiency.
Oficina Cecilia, one battery of 24 tanks	12	84.1%
Oficina Puelma, two batteries of 12 tanks	16	82.0%

It is, however, not always safe to compare operations in nitrate works, on account of variation in the clay content of the caliche, but the raw material in these two cases was similar; it may have been slightly more intractable at Oficina Cecilia. The evidence, however, does show that the shorter battery has advantages in economic operation.

The final point to consider is whether the theory can help in design work. One preliminary trouble is that reasonably accurate values for the diffusion coefficients are conspicuous by their absence. The method of analysing leaching performance, due to L. Battut ("Sucr. Indigene," 1886, *27*, 414) gives some indication, as the increase in the sugar concentration per 100 cc. is greater per vessel in those with the strong solution than in those with weak solutions at the wash water end of the battery. Owing to the fact that the strong solutions are run off from the battery at a considerably lower srength than can be obtained under operating conditions, it can be found by simple calculation that the concentration gradient at the strong end of the battery is considerably greater than at the wash water end, for beet sugar from 6 gm. per 100 cc. down to 0.2 gm. per 100 cc. Other factors influencing a slow rate of diffusion at the weak end are (a) lower temperature and (b) a longer distance for the dissolved material to diffuse. Actually, if solution is taking place, then the distance is only the thickness of the streamline film at the strong end, but has, in addition, half the diameter of the particle at the weak end.

Points from the Discussion

Mr. J. R. BLOCKEY said it was only within the last few years that it had been recognised that engineering played an important part in the leather industry. Hitherto all the training in that industry had been purely from the chemical point of view. Many tanners had now put up plants which, whilst they might not appeal to chemical engineers, were at all events a great advance on what the author had described. Not only did the tanner now treat his extract from his own materials, but there had been developed a side line to the tannin industry which was called extract manufacture and was a specialised process for extracting the tan from the raw materials and presenting it to the tanner in a more or less concentrated form. Speaking with regard to pressure leaching, Mr. Blockey said that some people, instead of leaving the leaches at atmospheric pressure, used autoclaves and high pressures, and that method was still adopted on the Continent. The difference between pressure extraction and atmospheric pressure extraction was that in the former a rather larger amount of material was extracted, but the ratio of non-tans to tans was rather higher with the open atmospheric pressure system.

Mr. W. RUSSELL said that gold leaching was the simplest method of leaching because there were only a few grams to be taken out and the rest of the material was not altered at all. There was practically no channelling in carefully prepared pulp and it all resolved itself into the handling of materials. He had also been interested in copper leaching and had seen a number of the plants described in the paper both for ammonia and acid leaching. The acid leaching problem was more difficult, because the volume of the material in the tank was being altered and unless care was taken in charging the tank there would be channelling. The method of filling the tanks at Chuquicamata had had a beneficial result in that respect, and increased the extraction to the extent of 15 per cent. after it was adopted at another plant. The leaching of copper ores at Chuquicamata involved many chemical problems, as well as mechanical problems, and they all needed careful attention. The crushing plant had a capacity of 50,000 tons per day and as this quantity had to be handled several times it called for a very complete organisation to ensure that the plant ran smoothly. The labour available there was not of the best, and the way in which the plant ran day in and day out was nothing short of remarkable.

Mr. H. GARNER BENNETT, speaking on the question of temperâture and the remark in the paper that an increase in temperature shortens the time, said that the author had also pointed out that the shorter time meant a purer product. There was, however, a vicious circle with regard to this question of increased temperature and sometimes it meant a less pure product. The position was that every individual case had to be dealt with on its merits. It could be said that it was very seldom that the optimum temperature or the purest tan coincided with the economic temperature.

Influence of Particle Size

Mr. W. C. PECK, speaking on the remark in the paper that in the extraction of ores and some vegetable matter the extracting fluid tends to lead solid particles along the channels present in the raw material, said that depended on the particle size. If the material was of some appreciable size, as in the beet sugar industry, no doubt that did occur, but in the case of material that had been dried and partially passed through a disintegrator the channels were not so important. He, personally, had found that increasing the speed of the liquid over the particles increased the speed of extraction to as much as three times. However, all vegetable materials could not be judged as one class; beet sugar was a very exceptional material, but root or bark was a very different material.

In the case of beet sugar the cells were usually full of liquid, but in the case of bark the material had been dried and the cell wall had collapsed, and the water within the cell had evaporated so that the material was precipitated inside the cell. When such materials were charged into a percolator there was a different action, according to whether the cells were broken or not. In the former case the material was dissolved immediately by the solution, but in the case of unbroken cells the material had first of all to be dissolved out by a solvent which had to pass through the cellulose cell wall and the material had to diffuse out through the cellulose cell wall as well as through the film which was at the liquid/solid interface.

Society of Public Analysts

The Alkaloids of Ergot

A MEETING of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on March 5, the president, Dr. G. Roche Lynch, being in the chair.

The hon. treasurer presented the accounts for the past year, and the officers and council for the year 1937 were elected as follows:—President, G. Roche Lynch; past presidents serving on the council, F. W. F. Arnaud, E. Richards Bolton, J. T. Dunn, Bernard Dyer, John Evans, Edward Hinks, G. Rudd Thompson, J. Augustus Voelcker; vice-presidents, A. L. Bacharach, H. E. Cox, B. S. Evans, A. R. Tankard, J. F. Tocher; hon. treasurer, E. B. Hughes; hon. secretary, Lewis Eynon; other members of council, E. B. Anderson, P. S. Arup, W. G. Carey, S. Dixon, F. W. Edwards, S. Elliott, B. G. McLellan, A. More, J. R. Nicholls, W. H. Roberts, J. G. Sherratt, W. H. Simmons, J. B. McKean, and J. R. Stubbs.

On the invitation of the Council, Professor G. Barger, D.Sc., F.R.S., gave an address on "The Alkaloids of Ergot." He said that at least eight alkaloids have been obtained from ergot, a parasitic fungus growing on rye and other grasses. These somewhat unusual bases, from a somewhat unusual source, comprise four pairs of interconvertible isomerides; in in each pair one isomeride is laevorotatory, has a powerful pharmacological action and a great tendency to crystallise in molecular combination with organic solvents; the other isomeride has a high dextrorotation, has little pharmacological action and crystallises without solvent.

All the alkaloids are hydrolysed to lysergic acid, $C_{16}H_{16}O_2N_2$, and indole derivative, capable of isomerisation; the two forms of lysergic acid correspond to the two series of alkaloids. In addition to this acid, ergometrine (which is the most important therapeutic principle of ergot), and its isomeride ergometrinine yield on hydrolysis merely hydroxy-iso-propylamine; the other alkaloids each gave instead of the amine, a series of products: ammonia, a keto acid, and two amino acids; these more complex alkaloids are akin to petides. This ergotinine, $C_{35}H_{39}O_5N_5$, furnishes lysergic acid, ammonia, isobutyrylformic acid, phenylalanine and proline. The pharmacological and toxic actions of ergotoxine, ergotamine and ergoclavine are very similar and highly characteristic. In the case of all the alkaloids the molecular formula has been established with certainty.

The various chemical and physical methods for the alkaloidal assay of ergot were discussed and finally an account was given of the two forms of the epidemic disease ergotism, the gangrenous and the convulsive type, which raged in former centuries.

Leather Trades Chemists

Forthcoming Conference at Copenhagen

A MEETING of the British Section of the International Society of Leather Trades' Chemists was held at the University, Leeds, on March 6, with Dr. R. H. Marriott, president, in the chair.

Dr. Parker announced that the Copenhagen Conference had been fixed for August 29 to September 3 next. Dr. D. Burton reported that the committee on the acidity of vegetable tanned leather had investigated the "Buffer Capacity" determination as previously described by Atkin and Thompson, and with some valuable results. This would be proposed as an official method at the Copenhagen Conference. The committee on the Analysis of Vegetable Tanned Leather were about to start the accumulation of data on "free water" determination, and appealed for workers in that investigation.

Mr. G. F. Robertshaw briefly described the work of the International Commission for the Study of Fats and of the British Standardisation Committee which, under the chairmanship of Mr. E. Bolton, deals with the work of the I.C.S.F. He referred to the attempts to find standardised procedures for the determination of the polybromides and hydroxyl values; he also mentioned the British Standards Institution Committees on Cod and Marine Animal Oils which were formulating standards for these oils. The British Section of this Society had carried out investigations on the determination of the "total oil" and water in sulphated oils. The "total oil" method described by Burton and Robertshaw had proved to have some useful applications.

Dr. J. G. Parker described his recent work on the analysis of vegetable tanning materials as regards the pre-heating of certain natural materials, and which would be the subject of a recommendation to the Copenhagen Conference.

Discussing the subject of "Metallic Soaps in Light Leather Manufacture," Mr. R. Faraday Innes, F.I.C., pointed out that the pink stains which frequently occur in some glacé kid yards, but not in others, are due not only to chrome soaps as published in 1929, but also to iron soaps. The iron may originate from two sources (a) the hydrochloric acid used which may contain anything from 3-65 parts per million Fe, (b) the iron pipe through which the chromic acid mixture is fed into the drum. Chrome soaps give a much fainter pink than a mixture of iron and chrome soaps, and appears to give less uneven dyeing, and it is recommended that iron in the chromic acid liquor as it enters the drum be kept down to a minimum. The pipe should be of lead or some acid-resisting alloy. Lime soaps are found, but only in very small quantities in liqe liquors from the greasiest skins. Long liming does not remove much grease from seal skins, though it transforms some of the surface grease to a lime soap which remains in the skin. Some specially thick grease from New Zealand pickled sheep pelts was found to be a water-in-oil emulsion caused by the presence of small quantities of calcium and iron.

Metallic soaps can form in finished leather if stored in damp atmospheres. Many boxes of semi-chrome gloves stored in a glover's warehouse had developed spue, whereas skins from the same pack stored by the tanner had remained clear. It was proved that the damp atmosphere in the glovers' warehouse had encouraged incipient invisible mould growth, the development of chrome soap and a large increase in free fatty acids. If the gloves had been stored in an atmosphere of relative humidity below 68 per cent. they would not have spued.

In a paper on "The Action of Nitrous Acid on Collagen," Mr. W. R. Atkin, M.Sc., said that nitrous acid reacts with amino groups (Nh_2) to give gaseous nitrogen. On intact proteins the number of amino groups reacting with nitrous acid had been found to correspond to half the lysine nitrogen. Nitrous acid, acting on gelatin or collagen reduced to practically half the acid combining power of the protein. An unexpected result of this action had been that the removal of amino groups by nitrous acid had caused a corresponding increase in the stronger free carboxyl groups (COOH) in the protein. It was demonstrated that this reaction gives an incontrovertible proof of the "zwitterion" or salt linkage structure of proteins.

New " Coalite " Coal-Oil Plant

Utilising Coal Resources of South Wales

THE impending establishment of a " Coalite " low temperature carbonisation plant on the southern outcrop of the South Wales coalfield was announced in the House of Commons on Tuesday by Mr. Ernest Brown, Minister of Labour. Negotiations, he said, had been proceeding between the Government, the trustees of the Nuffield Trust, and Low Temperature Carbonisation, Ltd., and had reached a point which would enable a large plant to be erected provided legislative sanction was given to the Government's proposals.

Colonel W. Bristow, chairman of Low Temperature Carbonisation, Ltd., stated in an interview that his company has made a systematic survey of the coal resources of South Wales, and has carried out a large number of practical tests on the various coals available. The laboratory work and the full scale tests on the coals were simultaneously carried out at the company's plant at Barugh, near Barnsley. As a result the company was able to inform the Government that coals had been found which were perfectly suitable for the process, and that no technical difficulties stood in the way of realising the Government scheme for a coal-oil plant in South Wales.

The new works would comprise a carbonising plant similar to that at Bolsolver and capable of treating 500-700 tons of coal per day. In addition, there would be a coal oil distillation plant arranged for the production of aviation petrol, Diesel oil, fuel oil, creosote, etc.; and also a large plant for the manufacture of tar acids and other chemical products for which a considerable export market had been established. The new scheme would be owned and operated by Low Temperature Carbonisation, Ltd., through a new subsidiary, the South Wales Coalite Co., Ltd.

It is proposed to erect the works and oil refinery at Pencoed, near Werntarw Colliery, where a suitable site exists close to the railway. It is hoped that erection of plant can be commenced at an early date.

Institute of Metals

Appeal for Endowment Fund

AN appeal for the establishment of an endowment fund was launched by Mr. W. R. Barclay, president, at the annual meeting of the Institute of Metals held at the Institution of Mechanical Engineers, London, on Wednesday. The objects of the fund are to place the finances of the Institute on a sound and more permanent basis, to assist the publications of the Institute and to extend the scope of the services offered by the Institute to members and to the non-ferrous metal industries generally.

Mr. Barclay stated that in preliminary discussions with several leading organisations and firms, including Imperial Chemical Industries, Ltd., the appeal had been sympathetically considered and promises or actual contributions amounting to about £7,000 had already been received. The aim of the Institute was to create as an endowment fund a capital sum of not less than £20,000.

Another important announcement on Wednesday was that as from January 1 a scheme of co-operation had been effected between the Institute of Metals and the Iron and Steel Institute under which members of each Institute can become members of the other without formality other than written application. Such members will pay a combined annual subscription of £5 5s., against individual subscriptions of £3 3s. to each Institute. In the case of new candidates the entrance fee of £2 2s. imposed by each Institute will become a combined entrance fee, so that it becomes possible to join both Institutes for a single payment of £7 7s. against £10 10s. The scheme is the first step in a more extensive plan of co-operation that is receiving the attention of the two councils.

Joints for Pressure Vessels

Factors which influence Strength of Weld

DEALING with " Welded Joints in Pressure Vessels " in a paper read before the Institution of Civil Engineers on Tuesday, Mr. S. F. Dorey, D.Sc., M.Inst.C.E., explained what is at present considered to be good practice and drew attention to the materials, processes and methods of testing and inspection, which experience has shown to give the most satisfactory results. Unlike the riveted joint, the welded joint does not lend itself to the calculation of joint-efficiency; it is only under certain conditions of manufacture and testing that a high efficiency can be allowed. The problem, said Mr. Dorey, is affected by various factors which influence the strength and soundness of the welds to such an extent that joints of similar appearance and similar scantlings may be very dissimilar in physical properties. The problem is partly metallurgical, partly chemical and partly mechanical. In certain aspects a properly made welded joint may be 100 per cent. efficient, whilst in other aspects the figure may be much lower. For example, the static strength of a fusion welded joint is invariably greater than that of the parent metal, whilst the fatigue endurance may only be 85 per cent. of that of the solid plate.

Documents in Criminology

Chemical and Physical Methods of Examination

RECENT work on the examination of documents in criminolgy formed the subject of an address, illustrated by lantern slides, given at Liverpool University on March 5 by Dr. C. Ainsworth Mitchell, M.A., F.I.C., before the Liverpool Section of the Society of Chemical Industry. The chairman of the Section, Professor T. P. Hilditch, presided.

Dr. Mitchell contrasted the present-day attitude of the courts towards scientific evidence on documents with that obtaining at the beginning of the century, and showed how new methods had gradually become admissible. The examination of watermarks had long been a subject in which lawyers had taken a special interest, and the lecturer referred to various cases, old and recent, in which evidence on that point had been given and had sometimes provided conclusive proof of the forgery of a document. Modern methods of counterfeiting watermarks and of detecting the forgery by optical and chemical methods were discussed, reference being made to a recent case in which a paper with the correct watermark had been specially fabricated.

Chemical methods of distinguishing between different kinds of paper could now often be replaced by optical methods, since both the sizing and the fibres might fluoresce differently in ultra-violet light. The method was particularly valuable for detecting chemical or mechanical erasure, for the surface of the paper would show a negative fluorescence, *i.e.* a dark area where there had been erasure of ink writing. Chemically " washed " stamps also could readily be detected in this way, but in Dr. Mitchell's experience it was quite possible to remove pencil marks without leaving any visible indication of the erasure. The ultra-violet lamp was also useful for distinguishing between different kinds of adhesives, especially in cases in which a letter had been opened and sealed down again, certain adhesives giving a " positive " and others a " negative " fluorescence.

The following officers were elected for the 1937-38 session: Chairman, Professor T. P. Hilditch; vice-chairman, Professor C. O. Bannister; hon. treasurer, Mr. A. E. Findley; hon. recorder, Dr. G. P. Gibson; hon. secretary, Mr. J. S. Towers; hon. auditors, F. Robertson Dodd and James Smith; committee, Messrs. F. C. Guthrie, F. Holt, H. G. Howson, H. E. Potts, and R. M. Winter; group representatives: Chemical Engineering, W. Ramsay Sibbald; Food, E. Gabriel Jones; Plastics, B. D. W. Luff; Road and Building Materials, A. E. Findley.

Petroleum Spirits

Applications in Industry

A LECTURE on the "Applications of Petroleum Spirits in Industry" was delivered by Mr. F. N. Harrap, M.Sc., before a conjoint meeting of the Northern Branch of the Institution of Petroleum Technologists and the Manchester Sections of the Society of Chemical Industry, the Oil and Colour Chemists' Association, and the Institution of the Rubber Industry at the Engineers' Club, Manchester, on Friday, March 5, when Mr. A. McCulloch, M.Sc., presided.

At the outset of his lecture Mr. Harrap dealt with the different grades of petroleum spirit which are available on the market in this country, and outlined the methods whereby they are obtained. He then discussed some of the more important applications of these spirits, and remarked that in spite of the recent development of electrical power schemes there are many country houses and hotels which depend upon petrol/air plants for their lighting and power requirements, whilst similar but larger units, driven by electric motors, are employed in various industrial operations.

Of the many industries which employ petroleum spirit in their manufacturing processes Mr. Harrap first cited the extraction of perfume from flowers, a process which necessitates the use of a high-grade solvent. He then discussed the use of petroleum spirit for extracting oil from oil-bearing seed, for the degreasing of bones, for the dehydration of alcohol by adding the spirit to the ternary mixture alcohol-benzene-water, for the nitrocellulose lacquer, printing ink, paint and varnish, rubber, and leather industries, and for the dry cleaning trade.

Radio-Elements

Their Significance in Chemical and Biological Research

RADIOACTIVITY is generally regarded as being somewhat remote from the interest of practical chemists; but the particular chapter dealt with by Professor F. A. Paneth in a lecture to the Society of Chemical Industry on March 1, has nothing to do with radioactivity in its proper sense, as here the radio-elements are used only as a means for the solution of chemical or biological problems.

Thanks to the extreme sensitivity of electrometric methods it is possible to detect radio-elements in much smaller concentrations than any other chemical substances; and as they are isotopic with ordinary elements we can in many investigations substitute a radio-element for its inactive isotope. Such use of radio-elements as indicators is frequently of great help if the behaviour of an element in very small concentration has to be investigated. Perhaps of even greater importance is a slightly different application. By mixing a fraction of a stable element with its radioactive isotope we can differentiate this fraction from the rest of the element, and then study the exchange of atoms of identical chemical properties. It is especially this use of "indicated atoms" which opens the door to otherwise insoluble problems.

As long as only natural radio-elements were known the investigations were confined to lead, bismuth and a few other heavy elements, but since the discovery of artificial radio-elements almost every chemical element can be obtained in the form of its radioactive isotope and the use of radio-elements as indicators has been greatly extended.

Amongst the problems to the solution of which radio-elements have contributed are the determination of the solubility of very slightly soluble compounds, the preparation of the volatile hydride of bismuth, the study of the permeability to air of almost completely airtight gas-mask fabrics, of the formation of alloys at low temperatures, the rate of solution of exceedingly thin films, and electro-deposition from extremely dilute solutions. With the help of "indicated atoms" the diffusion of lead into lead, the determination of the surface of adsorbing crystalline powders, the exchange of atoms of one and the same kind in chemical reactions has been studied for the first time. The active isotopes of carbon, phosphorus, sodium, calcium and other elements of special importance in biology make it possible to investigate the metabolism of these atoms. One could establish, *e.g.*, that phosphorus atoms which had entered the bones are sooner or later displaced by the arrival of fresh phosphorus atoms; and that similarly in plants an individual phosphorus atom which is situated in one leaf will after a few days be found in another leaf.

The use of radio-elements as indicators is steadily increasing, said Professor Paneth, and it is to be expected that in future many chemical, physical and biological laboratories will avail themselves of the great possibilities offered by this method in the study of an infinite variety of problems.

Utilisation of Spodumene

Removal of Associated Minerals

TECHNOLOGISTS at the Non-metallic Minerals Experiments Station of the National Bureau of Mines, in the United States, have found that the mineral spodumene, when heated in a lime kiln, is converted to a chalky white mass that can be crumbled between the fingers whilst all the other minerals present in the ore remain strong. Hence, a gentle mulling, followed by a sifting or the use of a gentle current of air, removes the spodumene from the undesired minerals. It is so simple and easy that it can be carried on in small home-made lime kilns set up by miners or farmers with little technical advice. This situation is likely to encourage the production of cheap spodumene.

The fine dust resulting from this treatment is about 80 to 90 per cent. pure, and from many localities this product will be of acceptable purity. It is much metter adapted to use in making lithium chloride than the original hard, dense spodumene. It is also ready to be used in a glass batch, unless nature happened to put magnetic iron minerals in the ore, in which case a preliminary removal of iron minerals would be needed. The pottery makers have desired to use spodumene, but it has been unacceptable because of the fact that at the temperature of a lime kiln it tended to expand and tear pottery to pieces. The beta spodumene formed by the heating and now to be sifted out of the heated ore has already been expanded and does not have this disadvantage.

Liquid Fuels from Coal

Professor J. S. S. Brame and Present Policy

DURING the discussion which followed a lecture to the joint scientific societies of Swansea, held under the auspices of the Institute of Petroleum Technologist's local branch, at the Central Hotel recently, Mr. Clarence Seyler said the conversion of coal into oil would only be justified for reasons of national defence. The lecturer was Professor J. S. S. Brame, formerly of the Royal Naval College, his subject being "Liquid Fuels from Coal." Mr. E. Thornton, refineries superintendent, National Oil Refineries, presided.

Professor Brame referred to the apprehension of the coal trade because of the increasing use of oil and the important question of oil supplies from the point of view of national defence. In 1933 there were nine low temperature carbonisation plants in operation, carbonising annually 318,000 tons, giving a yield of motor spirit of 741,000 gallons, approximately 2.33 gallons per ton; now there were about 14 such plants.

The lecturer proceeded to outline the present methods of carbonising. The hydrogenation plant at Billingham produced about 112,000 tons of motor spirit from coal. The production costs had been stated to be 7d. per gallon, not including interest on capital, but to-day petrol was landed in this country at a cost of about 2¼d. per gallon.

The City and Port of Hull

A New Handbook

HULL, the third largest port in Great Britain, and one which is steadily growing in size and importance, is an ideal site for factory or works. Its advantages and prospects are set out in attractive detail in a handbook entitled "The City and Port of Hull," issued by the City of Hull Development Committee. From the extremely well-illustrated pages of this booklet it can be seen that chemical and allied industries have already seized upon the opportunities offered by "Britain's cheapest port." General chemicals, chemical plant, plasticisers, solvents, industrial alcohol, acetates, insecticides and no less than fourteen branches of the oil trade are mentioned as being among the city's flourishing industries. But the openings are by no means exhausted. Hull can still offer many "excellent sites for factories, with or without river frontage and rail communication." Maps of the town, docks and sites are given in the handbook, together with charts of routes of communication. Hull "has regular steamship services with America; India; Australia; East, West and South Africa; the Far East; the Mediterranean; Egypt; the Baltic; Scandinavia; and Continental Ports, etc.," while, apart from "being linked up with 600 miles of inland water navigation to densely populated areas," it has regular and efficient road and rail services to every part of the country. Consequently it is an ideal centre for either import or export trade. The booklet also deals with the excellent public services in Hull itself, the low property assessments and ratings, and the modern planning and architecture of the streets, which make this a first-class industrial centre and a great world-port.

Analysed Samples

New Standards in Course of Preparation

THE Bureau of Analysed Samples, which took over from Ridsdale and Co. on December 1, 1935, the whole of their stock of British chemical standards and analysed samples for students, has now issued its first report showing that it has carried on the policy of the previous organisation under the directorship of Mr. N. D. Ridsdale, Mr. T. G. Elliot, and Mr. A. B. Jones.

In July, 1936, the high Ni-Cr.Cu austenitic iron "L" was standardised and issued. The following standards are now in course of preparation:—High carbon ferro chromium 204-2, low carbon ferro chromium 202-2, ferro vanadium 205-2, 0.5 per cent. carbon steel "F," rapid machining steel "D" (high sulphur and phosphorus), hematite iron "A3" (renewal of hematite iron "A"), Cr-Ni-Mo steel "B," and bronze "C" 88-10-2 containing 0.5 per cent. max. Pb. and about 0.05 per cent. P. Several other plain carbon steels and non-ferrous standard samples which have been suggested are under consideration.

Gross takings for the sale of standard samples amounted to £1,760, which is the maximum turnover since the commencement of the movement in 1916. The increase in sales is an indication that the re-organisation of the movement is approved by chemists generally, though some improvement can be attributed to the better trade in iron and steel and engineering industries. This has enabled the company to be self-supporting in the first year of its operation, and it is important that this should be so, as otherwise the activities of the movement would be crippled.

Contact has been made between the directors of the Bureau and the British Standards Institution which may lead to closer co-operation. Friendly associations have also been made with the National Bureau of Standards, in the United States.

The preparation of fresh turnings of standard carbon steels "H1" and "P" specially for sulphur by the evolution method, have been well received and the demand for these has steadily increased.

Carbide Works for Britain

Highlands Scheme Rejected

THE Caledonian Power Bill, which sought to set up a calcium carbide factory in the Highlands, was defeated by 188 to 140 in the House of Commons on Wednesday night. There was general agreement as to the necessity for establishing a calcium carbide industry in Great Britain, not only as a peace time measure, but as an essential requirement in war time.

Capt. RAMSAY, who moved the rejection of the bill, argued that it departed from the policy approved by the House of placing new industrial enterprises in the Special Areas.

Mr. BOOTHBY replied that the alternative was whether the calcium carbide industry should be established in this country or left in the hands of foreigners. The annual value of the import was about £2,000,000.

Mr. W. H. MAINWARING pointed out that the Commissioner for the Special Areas had pronounced South Wales a suitable region for the establishment of carbide works.

Sir J. GILMOUR argued that in other countries carbide was only produced by water power, predicting that if the Bill were defeated the Government would have to make arrangements for the establishment of a factory.

Mr. WALTER ELLIOT, Secretary for Scotland, remarked that there was no division in the House on the establishment of the carbide industry in this country. We consumed 60,000 tons a year at present. We should need 1,200 tons a week if war broke out. Germany was producing 400,000 tons a year, Italy 350,000 tons by hydro-electric plant. The factory was an essential need. Its location was a matter for the House. If the Bill were defeated the Government would take up the question. It was most improbable they would establish a State factory.

It is claimed by the South Wales Trade Recovery and Expansion Committee that whereas at least four years must elapse before a factory could be operating in the Highlands a factory in South Wales, operating on its own power plant, could be producing carbide in a much shorter time.

Tyrosine Metabolism

Problems of Interest to the Chemist and Biologist

PROFESSOR H. S. RAPER lectured on "Some Problems of Tyrosine Metabolism" at a meeting of the Chemical Society on March 4. Since the discovery of tyrosine by Liebig in 1846, he said, it has been shown to be of more than unusual interest as an amino acid because of the various transformations it may undergo in the body. These are of interest both to the chemist and the biologist. Two so-called inborn errors of metabolism are due apparently to defects in the normal mechanism for the oxidation of tyrosine. They are Alcaptonuria and Tyrosinosis. In the former homogenistic acid is produced and in the latter p-hydroxyphenylpyruvic acid. Being incapable of further oxidation they are excreted in the urine. Tyrosine almost certainly takes part in the formation of melanin, the black pigment of the skin, the hair and the choroid coat of the eyeball. The first stage in the production of melanin is due to oxidation of tyrosine to 3 : 4-dihydroxyphenylalanine and this by further oxidation, intramolecular rearrangement and loss of carbon dioxide yields 5 : 6-dihydroxyindole. This, in turn, by oxidation gives rise to melanin. An enzyme tyrosinase which has a wide distribution both in animals and plants will bring about these changes *in vitro*.

The chemical constitution of adrenaline shows that it is closely related to tyrosine. Many attempts have, therefore, been made to synthesise adrenaline from tyrosine or from some of its derivatives by means of suprarenal gland tissues, but so far without success.. Similarly, thyroxine the active principle of the thyroid gland is almost certainly produced from 3 : 5-diiodotyrosine. Biological methods as with adrenaline, have failed, however, up to the present to effect this synthesis by biological means.

Chemical Notes from Foreign Sources

Roumania

MAGNESIUM SULPHATE AND SODIUM BISULPHATE are to be produced by the Marasesti Chemical Company. The leather industry will be the principal market for the bisulphate.

Sweden

SYLVIA INDUSTRI A/B, of Landskrona, which produces soaps and other detergents, made a net profit of 600,000 Kr. (about £30,000) in the past year. A bonus in the form of one new share for every three old ones and a dividend of 12 per cent. has been recommended.

Germany

THE SYNTHETIC RUBBER DEPARTMENT of the I. G. Farbenindustrie has been transferred to a new company, Buna G.m.b.H., with a capital of 30 million marks.

COBALT IS EFFECTIVELY SEPARATED from solutions, according to a recent patent of Roder, by oxidation in solution (neutral or faintly alkaline or acid) with a chlorate under pressure at a temperature above 100° C. Under these conditions, cobalt hydroxide is precipitated almost quantitatively while the other metals remain in solution.

Estonia

DEPOSITS OF MANGANESE ORES have been located in the oil-shale bearing region of Jewe at a depth of 1,300 feet.

SHALE PRODUCTION increased from 600,000 tons in 1935 to 765,000 tons in 1936, while the corresponding figures for crude oil are 47,000 tons and 63,000 tons. Further evidence of the expansion in this industry is provided by the decision of the Estonian Oil Consortium to triple its output by installing two new furnaces and by the formation (with English capital) of Wanamöisa Oilfields, Ltd., to exploit shale deposits near Wesenberg, formerly owned by the State.

Russia

LUMINESCENT ZINC ORTHOSILICATE to be used in television screens is made by triturating zinc oxide and silica in water in the presence of an activator (a manganese salt) and calcining the mixture. Success depends upon the use of extremely pure material, the "chemically pure" materials of commerce being unsatisfactory. The optimum temperature of calcination is 1,200° C. and the proportion of manganese in the final product should be about 1 per cent.

France

THE COAL HYDROGENATION PLANT of the Soc. des Produits Chimiques Courrières-Kuhlmann, at Harnes (Pas-de-Calais), is now virtually ready for production. Erected at a cost of 40 million francs without State aid, the plant will have a commencing annual output of 25,000 tons motor spirit.

THE MODERN RESEARCH LABORATORY and the general equipment making for the maximum of efficiency, are discussed by P. Lecomte de Noüy in the January issue of "Chimie et Industrie." Air-conditioning with a view to maintaining unvarying atmospheric humidity and temperature as well as freedom from dust) throughout the year is regarded as the prime requirement.

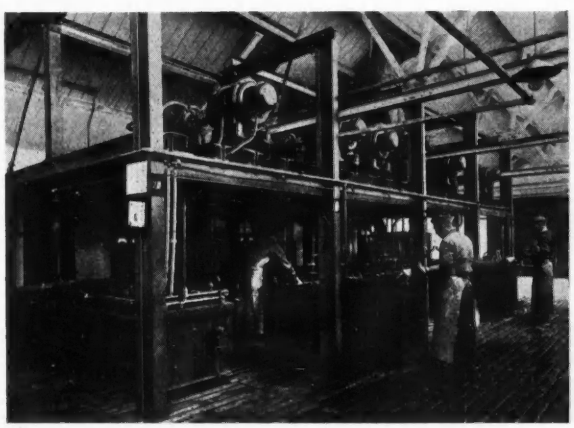
NEW COMPANY REGISTRATIONS include: — Compagnie auxiliare de l'industrie chimique "Cadic," 37 rue des Mathurins, Paris, capital 50,000 francs (chemical manufacturers and dealers); Soc. electro-chimique du Centre, C.E.C., 53, rue Reanmur, Paris, capital 1 million francs (general chemical manufacturers); Soc. d'application des pseudo-celluloses, 15 rue Caulaincourt, Paris (18), capital 26,000 francs (transparent paper manufacturers and dealers); Soc. Nouvelle de la Soie de Verre "Isover," 13 rue des Saussaies, Paris, capital 1,800,000 francs (manufacturers of "glass silk" for thermal and acoustic insulation).

Electroplating at Morris Works

Inspection by International Visitors

FOLLOWING the two days' International Electrodeposition Conference in London last week, a party of members visited the electro-plating plant of Morris Motors, Ltd., at Oxford, on March 5.

The radiators branch employs over 900 people and during an average year's output uses thirty tons of brass per week which it converts into no less than 110 miles of radiator film for the cooling elements. The electric current for the chromium-plating vats and for the radiator-making machinery totals 1½ million electric units per annum and for heating purposes 3,000 tons of coal are consumed.



The electroplating plant in the radiators branch of Morris Motors, Ltd., at North Oxford.

This factory possesses what is believed to be the largest automatic plating plant in the country, containing no less than three thousand gallons of plating solution. The components requiring plating are passed through an automatic degreasing plant, and then hung on the conveyor bars, which first dip them into a mechanically agitated bath of soap solution, then through similar bath of hot water, cold water, cyanide, cold water, acid swill and cold water before they are introduced into the plating vat. When the requisite deposit of metal has taken place the components are withdrawn and thoroughly cleaned by passing them through a mechanically agitated cold water bath and finally through a hot water bath.

All chromium plating used on Morris cars is deposited on a heavy nickel base of a minimum thickness of 0.001 in. and in the case of steel components they are first given a heavy deposit of copper beneath the nickel. The shops are kept exceptionally clean for the class of work carried out, thanks to an adequate ventilating plant and an extensive conveyor system which obviates the accumulation of stock in the workshops. All raw material undergoes careful testing in the laboratory on delivery to ensure that it is up to the high standard demanded, and every radiator is submerged in a water tank and subjected to an air pressure sufficient to bulge slightly the top tank in order to ensure that it is free from weak spots of leaks.

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BENZENE.—Researches on the diminution of resin formation in benzene in active carbon. D. Witt, *Gas u. Wasserfach, 80,* 85-88.

PAINT.—Paints containing little or no oil. O. Jordan, Fette u. *Seifen, 44,* 6-8.

The newer anti-rust paints. Dr. Rossmann, *Farbe u. Lack.,* 1937, No. 5, 53-54; No. 6, 68.

New methods for lacquering wood: Comparative tests for wood lacquers. B. Scheifele. *Farben-Ztg., 42,* 207-208.

VITAMINS.—The vitamin B group. E. Dane, *Chem. Ztg., 61,* 145-148.

ORGANIC.—The oxidation decomposition of C-C compounds. R. Criegee, *Angew. Chem., 50,* 153-155.

On saponification. F. Adickes, *Chem. Ztg., 61,* 167-168.

INORGANIC.—On the synthesis of ammonia by the catalytic action of metallic rhenium. C. Zenghelis and E. Stathis, *Osterreichische Chem. Ztg., 40,* 80-81.

TEXTILES.—Spots and stains in textile production, their origin, prevention and removal. H. Günther, *Färber-Ztg., 73,* 77-79.

MISCELLANEOUS.—On the relationship between analytical data and the combustibility of Diesel fuels. M. Marder, *Angew. Chem., 50,* 147-151.

Recent results in the chemistry of immunisation. H. Rudy, *Angew Chem., 50,* 137-147.

A specific test for Yperite in air. H. Eichler, *Osterreichische Chem. Ztg., 40,* 81.

Obtaining a crude nitrogen-hydrogen mixture for methanol and ammonia synthesis by condensation of coke oven gas at low temperature and high pressure. P. Ssakmin, *Brennstoff-Chemie, 18,* 69-71.

The constitution of organometallic bases and salts. K. A. Jensen, *Z. anorg. Chem., 230,* 277-285.

French

ANALYSIS.—Dehalogenation of organic iodine compounds by alkaline hydrogenation: Easy determination of small quantities of organic iodine. J. A. Gautier, *Bull. Soc. Chim.,* 1937, No. 2, 219-225.

CELLULOSE.—The identification and selection of chemical wood pulps. V. Gruemann, *Papier, 40,* 47-53.

INORGANIC.—Alumina gel and its applications. J. H. Frydlender, *Rev. Produits Chim., 40,* 65-69.

RUBBER.—Incorporation of glue in rubber mixtures. M. Faidutti, *Rev. Générale Caoutchouc,* No. 127, 24.

PAPER.—Micrography: The "fibre-weight-length" method and its applications. A. Albarranc, *Papier, 40,* 39-44.

PAINT.—Observations on fouling and processes for the maintenance of keels. H. Masseille, *Peintures Pigmente Vernis, 14,* 8-12.

MISCELLANEOUS.—Pine oil as an industrial wetting agent. M. L. Désalbres, *Matiéres Grasses Pètrole and ses Dérivés, 29,* 37-38.

Personal Notes

MR. J. J. BAINES, a director of Clayton, Son and Co., Ltd., was presented with a silver tray from the members of the official staff of the company on the occasion of his 75th birthday last week. Mr. Baines's connection with the company extends over nearly 57 years, commencing in 1880, when he was 19 years of age, and to-day Mr. Baines has the record of the longest service with the company. Present at the ceremony were Mr. R. G. Thomson and Mr. L. Hartley (directors), and Mr. S. Cawthorne (secretary), and the presentation was made on behalf of the officials by the two staff members with the longest service—Mr. B. Broadbent (53 years' service), on behalf of Moor End Works, and Mr. J. Rider (47 years' service), representing Pepper Road Works.

Mr. J. J. Baines.

MR. JOHN T. WILKINSON, of Staincliffe, Batley, Yorkshire, head of the firm of Wilkinson and Son (Oils), Ltd., oil merchants, left estate valued £40,951, with net personalty £37,389.

DR. J. J. BLACK, manufacturing chemist, Edinburgh; Mr. G. B. Brook, chief chemist, British Aluminium Co., Ltd., Dr. M. Ritchie, assistant lecturer in chemistry, Sheffield; Dr. A. M. Smith, lecturer in agricultural chemistry, Edinburgh; and Dr. H. Tod, biochemist, West House, Edinburgh, have been elected ordinary fellows of the Royal Society of Edinburgh.

MR. H. W. THOMPSON, of St. John's College, Oxford, has been appointed to the post of University demonstrator in chemistry for two years as from October next.

DR. J. F. TOCHER, of Aberdeen, consulting chemist to the Highland and Agricultural Society, has received the honorary degree of LL.D. from Aberdeen University.

MR. J. C. VREDENBURG-INGLESBY has resigned from the board of British Industrial Plastics, Ltd., owing to pressure of work in other directions.

PROFESSOR SVEDBERG, director of the Physical Chemical Institute, Upsala, Sweden, has received the honorary degree of Doctor of Science, honoris causa, from the University of Oxford. Professor Svedberg is a Nobel prizeman, and is the inventor of an ultra-centrifuge which has just been installed in the Department of Biochemistry at the University and was there inaugurated in the presence of the vice-chancellor and the president of the Royal Society.

MR. EDWARD M. HOLLINGSWORTH, who for sixteen years directed the electrical power development of the United Alkali and Imperial Chemical Industries plant at Widnes and was associated with the erection of the power station at Widnes, died suddenly last week. Before going to Widnes Mr. Hollingsworth, who was 66 years of age, and resided at St. Helens, was chief assistant to the St. Helen's Corporation electrical undertaking, until in 1906 he became borough electrical engineer. He held that position until 1918, when he was appointed chief electrical engineer of the United Alkali Co., at Widnes. Within a short period he was transferred to Imperial Chemical Industries. He retired in December, 1934, and since then had been acting as consulting engineer to a number of firms in different parts of the country.

From Week to Week

STAINLESS STEEL for the construction of 60 vats for the Tuborg Brewery in Copenhagen has been ordered from Firth-Vickers Stainless Steels, Ltd., Sheffield, by the Danish company, Jernkontoret.

THE ANNUAL DINNER AND DANCE of the London Section of the British Association of Chemists, will be held at the Waldorf Hotel, Aldwych, W.C.2, on Saturday, March 20. Tickets, 10s. 6d., may be obtained from the general secretary, "Empire House," 175 Piccadilly, London, W.1.

QUANTITIES OF OIL AND GREASE made a spectacular fire at the oilworks of T. H. Newsome and Co., Ltd., oil and grease merchants, of Canning Street, Dewsbury Road, Leeds, on March 7. The works consist of a single-storey brick building covering an area of about 2,000 square yards. Boiling plant, distilling machinery, and tanks and drums of oil and grease were destroyed.

A COLLECTION of original specimens of Parkesine, a forerunner of celluloid, prepared from about 1855 to 1868 by the inventor, Alexander Parkes (1813-1890), has been placed on exhibition at the Science Museum, South Kensington. These are the gift of the inventor's son, Mr. Alexander Parkes, and they include door-knobs, cog-wheels and other objects made of Parkesine. Specially interesting are some thin films of this material, which antedate any other film of celluloid.

GERMANY'S CLAIM TO HAVE PRODUCED a really good substitute for rubber is probably justified, says the annual report of Symington and Wilson, rubber brokers, but this is produced at very great expense and has so far been turned out only in small quantities. It is stated that the German substitute known as Buna costs about Rm.5 per kilo to produce. The Government pays a subsidy of Rm.1 per kilo, so that the cost to the German manufacturer is Rm.4 per kilo, equal to 6s. 8d. per kilo, or about 3s. per pound. For certain purposes where resistance to oil is required, Buna is said to be superior to rubber, and it has been claimed by the German Government that tyres made from this material wear longer than those made from natural rubber.

MR. J. H. FREMLIN, secretary of the Cambridge Scientists' Anti-War Group, in a letter to the Press referring to recent statements in the House of Commons, says:—"We should like to make it quite clear that the Cambridge Scientists' Anti-War Group is not a political body, and that the majority of our members do not belong to any political party. Scientists are often accused of indifference to the account to which their work is turned. It seems unfair that when some of them do at last try to apply their special training to affairs of some public moment their results should be condemned, without trial, as politically biased."

THAT GERMANY IS INCREASING HER PRODUCTION of artificial staple fibre very rapidly is indicated by the announcement that the Rheinische Zellwolle A.G. proposes to increase its capital from Rm.600,000 to Rm.3,400,000. The Rheinische Zellwolle requires the extra capital to pay the great rayon concern of Wuppertal Bemberg A.G. for the purchase of the Siegburger works originally built by Bemberg to manufacture rayon, but never used.

A MODERN INDUSTRIAL ESTATE is to be developed by the Scottish Industrial Estates, Ltd., at North Hillington, midway between Glasgow and Paisley. Plans have been approved for the layout of the estate, covering about 100 acres, and the scheme is designed to cater both for the large and the very smallest firms. The company, which will not operate for profit, has appointed Mr. D. Sinclair Hay as general manager and secretary.

THE SIXTEENTH EXPOSITION OF CHEMICAL INDUSTRIES will be held at Grand Central Palace, New York, from December 6 to 11, 1937. Advance leasing to date indicates that the 1937 exposition will be one of the largest in recent years. A feature of the deposition will be a prize competition for a slogan typifying the role of chemical industries in modern life. The slogan will be expected to represent accurately the purposes of the chemical industries and the benefits accruing to mankind from their activities.

LARGE DEALS IN WHALE OIL—in excess of £2,000,000—are reported to have been concluded in Sandefjord, Norway. The total quantity involved is 102,500 tons at a price of £21 per ton. The Hector Whaling Co., and the United Whalers, Ltd., are stated to have sold 15,000 tons to the Southern Oil Co., of Manchester, at £21, plus an additional 2s. 6d. per ton for local habour charges. The same two companies have sold the rest of their production—about 8,000 tons—to Unilever and the Norwegian "De-No-Far." With other sales this makes a total of 102,500 tons, equivalent to about 615,000 barrels, and the sale price comes to about 43,000,000 Norwegian kroner (£2,162,500).

A PROFUSELY ILLUSTRATED INVITATION to the Achema VIII Chemical Engineering Exhibition has just been published. This exhibition is beng held from July 2 to 11, 1937, at Frankfort-on-Main, on the occasion of the National Congress of German Chemists, the Semi-Centennial General Meeting of the Verein Deutscher Chemiker as also of other meetings of scientific and technical societies. The prospectus, giving arrangement and other important details of this unique exhibition, contains an excerpt from the list of exhibiting firms. The number of exhibitors already totals nearly 300. Interested firms and persons will receive the prospectus free of charge from the organisers, the Dechema, Deutsche Gesellschaft für chemisches Apparatewesen E.V., Potsdamerstrasse 103a, Berlin W. 35.

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

PAINTS AND PIGMENTS.—Imperial Smelting Corporation, Ltd. Aug. 24, 1935. 19973/36.

PROCESS FOR PRODUCING LUBRICATING OILS.—Ruhrchemie, A.-G. Aug. 24, 1935. 21393/36.

PHOTOGRAPHIC DEVELOPING AGENTS.—I. G. Farbenindustrie. Aug. 31, 1935. 21550/36.

RUBBER-LIKE MATERIALS and method of producing same.—American Cyanamid Co. Aug. 30, 1935. 21590/36.

PROCESS FOR THE PRODUCTION OF BLUE PIGMENTS.—Kali-Chemie, A.-G. Aug. 28, 1935. 21997/36.

PROCESS OF TREATING WATER.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 30, 1935. 22365/36.

RAW MATERIAL FOR THE MANUFACTURE OF FILLERS.—L. Vichnevetzky. Aug. 24, 1935. 22619/36.

PROCESS OF DISTILLATION OF NATURAL GLYCERIDES.—Eastman Kodak Co. Aug. 24, 1935. 22675/36.

PREPARATION OF STEROL DERIVATIVES.—Parke, Davis and Co. Aug. 26, 1935. 22730/36.

PROCESS FOR THE PRODUCTION OF HYDROCARBONS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 26, 1935. 22856/36.

Specifications Accepted with Date of Application

LIGHT-SENSITIVE MATERIAL for colour photography.—W. W. Groves (I. G. Farbenindustrie). July 13, 1935. 461,559.

TREATMENT OF TEXTILE AND OTHER FIBROUS MATERIALS.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 15, 1935. 461,614.

APPARATUS FOR THE MANUFACTURE AND PRODUCTION OF CARBON BLACK.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 17, 1935. 461,497.

PROCESS FOR THE MANUFACTURE OF VAT DYESTUFFS.—I. G. Farbenindustrie. Aug. 16, 1934. 461,432.

DYESTUFFS.—J. D. Kendall Aug. 16, 1935. 461,668.

PRODUCTION OF CELLULOSE DERIVATIVES.—E. I. du Pont de Nemours and Co. Aug. 16, 1934. 461,436.

PRODUCTION OF RESIN-COATED ABRASIVE GRAIN for abrasive articles.—W. J. Tennant (Carborundum Co.). Aug. 16, 1935. 461,437.

RENDERING TEXTILES WATER-REPELLING.—G. W. Johnson (I. G. Farbenindustrie.) Aug. 17, 1935. 461,670.

MANUFACTURE OF ALKALI SULPHIDES.—W. W. Groves (I. G. Farbenindustrie.) Aug. 19, 1935. 461,674.

PRODUCTION OF SOLUTIONS OF POLYMERIC ACRYLIC ACID NITRILE. I. G. Farbenindustrie. Aug. 21, 1934. 461,675.

OIL PAINTS.—L. C. Neale. April 16, 1935. 461,508.

PRODUCTION OF ACETYLATED ALKYLTRIMETHYLOLMETHANES and the use thereof.—Bombrini Parodi-Delfino. Aug. 17, 1934. 461,623.

Applications for Patents

PREPARATION OF AN ALKALI CYANIDE.—American Cyanamid Co. (United States, March 10, '36.) 5430.

MANUFACTURE OF CELLULOSE DERIVATIVES.—British Celanese, Ltd. (United States, Feb. 24, '36.) 5566.

FLAMEPROOFING-COMPOSITIONS, ETC.—British Sidac, Ltd. (Morgan). 4922, 4923.

MANUFACTURE OF ANTHRAQUINONE COMPOUNDS.—F. Brown. 4886.

DYEING, ETC., OF TEXTILE MATERIALS.—Calico Printers' Association, Ltd., and L. A. Lantz. 5119.

DRYING, ETC., ADSORBENTS.—Carbo-Norit-Union Verwaltungs-Ges. (Germany, July 11, '36.) 4877.

MANUFACTURE OF ACID WOOL DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) 5458.

MANUFACTURE OF VAT DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) 5459.

MANUFACTURE OF DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) 5594.

OXIDATION OF AMMONIA.—T. Chmura. (Poland, Feb. 24, '36.) 5398.

PREPARATION OF DYESTUFFS.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. (France, March 27, '36.) 5109.

CORES FOR MOULDS.—Corhart Refractories Co. (United States, May 26, '36.) 5429.

PRODUCTION OF ARTIFICIAL FILAMENTS, ETC.—Courtaulds, Ltd., and J. H. Givens. 5452.

MAKING LACQUERS, ETC.—Deutsche Celluloid-Fabrik. (Germany, March 19, '36.) 5414.

MANUFACTURE OF SOAP-FORMING CARBOXYLIC ACIDS.—Deutsche Hydrierwerke, A.-G. (Germany, Feb. 20, '36.) 5309.

MANUFACTURE OF OXYGEN-CONTAINING COMPOUNDS.—H. Dreyfus. 5036.

MANUFACTURE OF ORGANIC COMPOUNDS.—H. Dreyfus. 5037.

PRODUCTION OF OXYGENATED ORGANIC COMPOUNDS.—H. Dreyfus. 5146.

MANUFACTURE OF ALIPHATIC COMPOUNDS.—H. Dreyfus. 5408.

MANUFACTURE OF SYNTHETIC RESINS.—E. I. du Pont de Nemours and Co., and R. T. Fields. 5085; and B. M. Marks. 5086.

COATING-COMPOSITIONS.—E. I. du Pont de Nemours and Co., and G. R. Ensminger. 5462.

Chemical and Allied Stocks and Shares

THE industrial section of the Stock Exchange has been less buoyant and the general tendency has been to lower prices, sentiment having been affected by the easier tendency which has again developed in British Government stocks. Shares of companies identified with the chemical and allied industries reflected the general tendency and lost part of the gains established in the previous week. Imperial Chemical are 39s. 4½d., compared with 40s. a week ago. Turner and Newall have declined 1s. 3d. to 105s. 6d., but were relatively steady later, aided by market expectations of an increase in the interim dividend. Distillers have gone back from 109s. 9d. to 106s. 6d., but Salt Union recovered from 38s. 9d. to 40s.

Cooper, McDougall and Robertson were steady, aided by the possibility that the results may show a rather larger dividend, and General Refractories were also firm, market anticipations that the dividend will again be brought up to 15 per cent. on the larger capital having remained current. Greeff Chemicals Holdings were reported to be more active and British Industrial Plastics remained active around 3s. 1½d. Imperial Smelting ordinary shares continued to receive a good deal of attention on the trend in the price of zinc. United Glass Bottle have held most of the rise which followed the announcement that negotiations have been almost completed for the acquisition by the company of the bottle making activities of the Distillers Co., and its subsidiaries. Canning Town Glass were firm, awaiting the impending dividend announcement.

British Oil and Cake Mills preferred were steady at 47s. 9d. assisted by the belief that the forthcoming results will show that profits have been well maintained. There was also increased activity reported in Unilever, but best prices were not held, there having been a decline of 9d. to 43s. at the time of writing. The reports of Unilever and Lever Brothers fall to be issued next month. It is expected in the market that Unilever will show improved profits, but there are doubts whether the directors will decide to pay an increased dividend at this stage. United Premier Oil and Cake 5s. shares have been more active around 10s. 7½d. on the assumption that the 10 per cent. dividend and 5 per cent. share bonus payments will be repeated for the past year. United Molasses were active and little changed at 30s. 1½d.

Boots Pure Drug lost nearly all their rally of the previous week, there having been a decline from 56s. 10½d. to 54s. 9d., and Sangers and Timothy Whites and Taylors did not keep best prices. British Drug Houses continued steady on the view that the dividend is likely to be repeated at 5 per cent. Courtaulds were steady around 53s. 9d. There were few movements of importance among cotton textile shares and prices generally tended downwards. Staveley and Stanton were active among iron and steel issues, attention having been drawn in the market to the excellent dividend records of these companies and to the possibility of increased distributions for the current year.

Pinchin Johnson lost a few pence to 52s., but International Paint remained firm at 79s., on the increased dividend recently announced. Other paint shares were steady, including Blythe Colour Works ordinary whose results are expected to be issued shortly. Oil shares were less active and most of the internationally-dealt-in shares such as "Shell" and Royal Dutch were lower, there having been selling on the part of French investors who had purchased these and other similar shares as a safeguard against any possible further decline in the franc. The market is continuing to talk of higher oil prices and of a further increase in British petrol prices during the next few months.

Prices of Chemical Products

WITH the exception of the items mentioned below the prices of chemical products remain as reported in THE CHEMICAL AGE last week (pages 220-221.)

MANCHESTER.—The steep upward movement of metal prices continues to exercise an unsettling influence upon the market position of the copper, lead and zinc products, the values of which are stiffening almost daily. So far as prices are concerned, these are the outstanding sections of the chemical market, though quotations generally at Manchester during the past week have been steady to firm. New business this week has been on a moderately active scale and, on the whole, sellers have little of which to complain from the point of view of contract deliveries, specifications for supplies so far this month having covered fair quantities of the principal heavy materials. In the market for by-products naphthalene values are tending upward and pronounced strength continues to be reported in respect of cresylic acid and crude carbolic acid.

GLASGOW.—Prices generally continue firm with an advancing tendency, on account of the increasing cost of raw materials. Metal products are again dearer, red and white lead having been increased further £1 per ton, on account of the advance in pig lead. There has been a week of steady trading conditions in all products of the coal tar group. The continued scarcity of supplies of cresylic acid is disappointing to both buyers and sellers, and whether the speeding up effect upon manufacturers will in the end satisfy consumers, remains a topic for speculation. While no price changes are reported there is still little sign of any depreciation of values. Crude and refined benzole are well looked after. A number of fresh inquiries for pyridine bases are in circulation, and further price advances seem probable. Creosote continues very steady, and a fair bulk of pitch for export has changed hands.

General Chemicals

LEAD ACETATE.—LONDON: White, £35 10s. per ton; brown, £35. GLASGOW: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £37 10s.; brown, £36 10s.

LEAD, RED.—SCOTLAND: £45 10s. per ton less 2½%, carriage paid, for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £45 10s. per ton, carriage paid, for 2-ton lots.

SULPHATE OF COPPER.—£20 per ton, less 2%, in casks. MANCHESTER: £25 per ton f.o.b. SCOTLAND: £25 10s. per ton less 5%, Liverpool, in casks.

Coal Tar Products

ACID, CRESYLIC.—97/99%, 4s. 2d. to 4s. 3d. per gal.; 99/100%, 4s. 6d. to 5s. per gal., according to specification; pale 99%, 4s. 4d. to 4s. 5d.; dark, 3s. 8d. to 3s. 10d. GLASGOW: Pale, 99/100%, 4s. to 4s. 6d. per gal.; pale, 97/99%, 3s. 6d. to 4s.; dark, 97/99%, 3s. 3d. to 3s. 6d.; high boiling acids, 2s. 3d. to 2s. 6d. American specification, 3s. 6d. to 4s. MANCHESTER: Pale, 99/100%, 4s. 4d.

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 2s. 11d. to 3s. 2d. per gal. MANCHESTER: Crystals, 6¾d. to 7d. per lb.; crude 3s. 4d. per gal. GLASGOW: Crude, 60's, 3s. to 3s. 6d. per gal.; distilled, 60's, 3s. 6d. to 4s.

NAPHTHA.—Solvent, 90/160%, 1s 6½d. to 1s. 7½d. per gal.; 95/160%, 1s. 7d. to 1s. 8d.; 90/190%, 1s. 1½d. to 1s. 2½d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW: Crude, 6d. to 6¾d. per gal.; 90% 160, 1s. 4d. to 1s. 5d. 90% 190, 1s. to 1s. 1d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £11 10s. to £12 10s. per ton; purified crystals, £18 to £20 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined £24 per ton f.o.b.

PYRIDINE.—90/140%, 8s. 6d. to 9s. 6d. per gal.; 90/180, 2s. 6d. to 3s. GLASGOW: 90% 140, 9s. to 10s. per gal.; 90% 160, 7s. to 8s.; 90% 180, 2s. 6d.

XYLOL.—Commercial, 2s. 2d. per gal.; pure, 2s. 4d. GLASGOW: Commercial, 1s. 11d. to 2s. per gal.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Egypt.—The Commercial Counsellor to the British Embassy at Cairo reports that the Department of Survey and Mines, Giza (Orman), Egypt, is calling for tenders, to be presented in Egypt by April 7, for the supply of sensitive paper and chemicals. (Ref. No. T.Y. 31,207.)

Company News

Midland Tar Distillers.—An interim dividend of 2½ per cent., free of tax on the ordinary shares has been announced.

International Nickel of Canada.—An interim of 7 per cent. per annum on preferred stock for quarter, payable in sterling at cable rate of exchange on New York obtaining in London at opening of business on May 1, is announced.

International Paint and Compositions.—For 1936 the final payment on the ordinary shares is 12 per cent., making 16 per cent., less tax, against 14 per cent. for 1935, and 10 per cent. for 1934. Payment will be made on March 31. Profits expanded from £115,090 to £125,624.

Evans Sons Lescher and Webb.—The trading profit for 1936 amounts to £58,159 (£53,837); deduct mortgage interest £3,638, directors' fees £2,100, tax provision £13,118, etc., leaving £35,520; add £5,246 brought in, making £40,766. To general reserve £15,000 (same); one and a-half year's dividend on 6 per cent. preference shares (less tax) £16,594, forward £9,172.

British Oil and Cake Mills.—A slight increase in trading profits, etc., in 1936 from £710,928 to £717,458, is announced. The depreciation provision, however, is increased from £30,000 to £49,515, which leaves net earnings down from £586,836 to £574,987. The dividend on the £3,500,000 of ordinary stock, all of which is held by Lever Bros., is maintained at 10 per cent., less tax, and the carry-forward is reduced to £50,899 from £51,210.

W. Canning and Co.—Trading profit for 1936 (after providing for tax) amounts to £89,873 (against £78,211 in 1935) and total profit is £96,930 (£84,586). After depreciation, £12,361 (£11,994), directors' fees, £1,000 (same), net profit was £83,570 (£71,592). Sum of £10,000 (same) placed to general reserve and £10,000 (£5,000) to contingency fund. The year's dividend is unchanged at 10 per cent., but bonus is increased from 12½ per cent. to 15 per cent. Amount carried forward is £28,292 (£23,910).

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BELPLASTIC (LONDON), LTD. (M., 13/3/37.) Feb. 24, £725 debenture, to Sir W. Cope, Bart, Cardiff; general charge.

DENHAM LABORATORIES, LTD. (M., 13/3/37.) March 2, £52,000 mortgage (inclusive of £27,000 outstanding under debenture dated January 12, 1937), to New Trading Co., Ltd.; charged on land and buildings at Denham, etc.

SULFUROPHOSPHATE MANUFACTURING CO., LTD., Kidderminster. (M., 13/3/37.) Feb. 26, series of £3,500 A debentures present issue £3,000; charged on plant, machinery, equipment, etc., in and about company's works, offices and laboratory at Devonport; also Feb. 26, series of £10,500 B debentures present issue £6,200; charged on general assets including uncalled capital other than plant, machinery, etc., covered by A debentures.

Satisfactions

CALMIC, LTD., Liverpool, chemical manufacturers, etc. (M.S., 13/3/37.) Satisfaction March 2, £2,220, registered December 23, 1932.

RENNY FORBES AND CO., LTD., Wembley, chemical manufacturers. (M.S., 13/3/37.) Satisfaction February 24, £7,000, registered June 24, 1914, June 29, 1920, and December 20, 1926.

TRINIDAD PETROLEUM DEVELOPMENT CO., LTD., London, E.C. (M.S., 13/3/37.) Satisfaction February 24, of Trust Deed registered July 27, 1929.

Companies Winding-up Voluntarily

UNIVERSAL CHEMICAL HOLDINGS, LTD. (C.W.U.V., 13/3/37.) By special resolution March 1, 1937. Mr. Herbert M. Gowar of Staple House, 51-52 Chancery Lane, London, W.C.2, and Mr. Don S. Momand of 10-15 Chitty Street, London, W.1, appointed liquidators.

THE BRITISH PLYMOUTH RUBBER THREAD CO., LTD. (C.W.U.V., 13/3/37.) By special resolution, March 4, 1937. Mr. Duncan McKellar, of 71 Queen Street, London, E.C.4, appointed liquidator.

Forthcoming Events

LONDON.

Mar. 17.—Chemical Society and Mineralogical Society. Seventh Hugo Muller Lecture. "Principles of Distribution of Chemical Elements in Minerals and Rocks." Professor Dr. V. M. Goldschmidt. 5.30 p.m. Lecture Theatre of the Royal Institution, Albemarle Street, London.

Mar. 17.—Institute of Chemistry. "Chemistry in the Building Industry." F. L. Brady. London.

Mar. 18.—Chemical Society. Ninety-sixth Annual General Meeting. 4 p.m. Burlington House, Piccadilly. Anniversary Dinner, 7 p.m. Grosvenor House, Park Lane, London.

Mar. 18.—Institute of Metals. (London Section). "Refractories." J. H. Partridge. 7.30 p.m. Rooms of the Society of Motor Manufacturers and Traders, Ltd., 83 Pall Mall, London.

Mar. 19.—Royal Institution of Great Britain. "The Transmutation of Heavy Elements." Lord Rutherford of Nelson. 9 p.m. 21 Albemarle Street, London.

Mar. 20.—British Association of Chemists. (London Section). Annual Dinner and Dance. 6.30 p.m. Waldorf Hotel.

BIRMINGHAM.

Mar. 15.—Chemical Society and Birmingham University Chemical Society. Paper by Professor R. Robinson. 5 p.m. Chemical Department, Edgbaston, Birmingham.

Mar. 16.—Institute of Metals (Birmingham Section). Discussion on "Lubrication in the Cold Working of Metals." Introduced by H. W. Brownsdon and F. J. Slee. 7 p.m. James Watt Memorial Institute, Birmingham.

Mar. 17.—Society of Chemical Industry (Birmingham Section). "Modern Detergents." Professor T. P. Hilditch. 7.30 p.m. University Buildings, Edmund Street, Birmingham.

Mar. 18.—Institute of Vitreous Enamellers. (Midland Section). "Importance of Temperature Control with particular reference to Vitreous Enamelling." H. Astbury. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

Mar. 19.—Institute of the Plastics Industry. (Birmingham Section). "The Continuous Moulding of Thermo-setting Compounds." P. A. Delafield. Grand Hotel, Birmingham.

EDINBURGH.

Mar. 17.—Society of Chemical Industry and Institute of Chemistry (Edinburgh Sections). "Some Fundamental Laws of Chemical Change." Professor C. N. Hinshelwood. 7.30 p.m. North British Station Hotel, Princes Street, Edinburgh.

MANCHESTER.

Mar. 15.—Institute of the Rubber Industry. (Manchester Section). "Problems in Practical Rubber Chemistry." Dr. J. G. Mackay. 7 p.m. Constitutional Club, St. Ann's Street, Manchester.

Mar. 17.—Manchester Metallurgical Society. Annual Meeting. "The Electric Bright Annealing of Metals." A. G. Robiette. 7 p.m. Constitutional Club, St. Ann's Street, Manchester.

Mar. 17.—British Association of Chemists. (Manchester Section). Annual Dinner. 7.30 p.m. Engineers' Club, 17 Albert Square, Manchester.

Mar. 19.—Manchester Literary and Philosophical Society. (Chemical Section). Annual General Meeting. "Chemical Structure and Hormone Activity." Dr. W. F. Short. 7 p.m. 36 George Street, Manchester.

Mar. 19.—Society of Dyers and Colourists. (Manchester Section). "A New Chlorine Unshrinkable Finish on Wool." A. J. Hall. 7 p.m. Constitutional Club, St. Ann's Street, Manchester.

NEWCASTLE-UPON-TYNE.

Mar. 15.—Institute of Chemistry. (Newcastle-upon-Tyne Section). Address by Professor J. W. H. Harrison. Newcastle.

STOURBRIDGE.

Mar. 17.—Society of Glass Technology. "Statistical Methods Applied to the Manufacture of Spectacle Glasses." G. E. Gould and W. M. Hampton. "Special Alloys for Use in the Glass Industry." M. Parkin and Professor W. E. S. Turner. 2 p.m. Talbot Hotel, Stourbridge.

BRISTOL.

Mar. 18.—Institute of Chemistry. (Bristol Section). Annual Meeting. "Evidence of Inks and Pencil Pigments." Dr. C. A. Mitchell. 5.30 p.m. Chemical Department, The University, Woodland Road, Bristol.